# TELEPHONE ENGINEER

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## "SOMEBODY PAYS"

In discussion of telephone affairs before the Up-State Telephone Association of New York, President MacKinnon of the United States Independent Association stressed strongly the point that the services represented by the 4½% payment in the Bell System is a necessary part of the cost of telephone operation. In the Independent field, a portion of this cost is paid in the higher cost of equipment since the manufacturers' development cost must be absorbed in the cost of the apparatus and certain parts of the apparatus are purchased instead of leased. The other portion of the cost representing engineering, accounting and legal services of a general nature are paid for by contributions to the various associations which render these services to their member companies.

"Somebody pays," said Mr. MacKinnon, which is a true statement but it does not cover the case. It has been pointed out repeatedly in these columns that while "somebody pays" they do not pay enough. The telephone companies do not pay enough to the associations to enable them to be of maximum service in all lines of activity in which they might engage and as a result every association has had to limit its activities to certain fields although the work that could be done in others is apparent. The telephone user does not pay enough to the telephone companies, in the larger number of cases, to enable the companies to support the associations adequately and as a result the subscribers receive service that is inadequate in some respects because the companies do not have proper advisory service. The remedy is to adjust upward the amount that everybody pays so that adequate service may be rendered all the way along the line.

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## AUTOMOBILES AND TELEPHONES—AND BATHTUBS

An editorial writer in one of the Hearst papers recently took occasion to comment upon the report given out from within the automobile industry that there are now more automobiles than telephones in use in this country. With the unerring instinct of such writers, he finds a catch line that appeals to the unthinking and with logic that is far from unerring proceeds to deliver a homily on the benefits of competition versus monopoly.

An automobile may be secured by stepping around the corner and signing on the dotted line while it requires "long uncertain waiting" to get a new telephone put in because the telephone "monopoly" can not keep up to the demand. The telephone monopoly should learn something from Henry Ford by cutting its prices. So runs the argument of the story.

We must admit a lack of the mental alertness that will enable us to discover just how cutting prices would enable the telephone industry to overcome its alleged failure to keep up with the demand. Perhaps it is because we are not the editor of a Hearst paper with an "anti-monopoly" complex.

As we have been thinking over the subject, we have been wondering just how the editor would have treated the matter if the comparisons had been made between automobiles and some other article of general use, as for instance bathtubs. A bathtub in an operating condition complete with all accessories can not be secured "in a minute by walking around the corner and signing your name on the dotted line." Certainly millions more bathtubs could be used in this country. Perhaps the bathtub manufacturers could learn something from the automobile manufacturers by cutting prices. But the futility of our speculation lies in the fact that the bathtub industry is not a "monopoly" and the comparison would therefore be unsuitable for editorial purposes.

After all, perhaps the country has as many automobiles and as many telephones—and as many bath tubs—as it wants and it will have more when the individual citizens signify their need by signing on the dotted line whether the dotted line be on a note for the unpaid portion of the purchase price of an automobile, a telephone contract or a contract with a master plumber to install bathroom fixtures.

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## A REWARD FOR EFFICIENCY.

In a number of recent decisions of public service commissions, there are indications that the commissions are coming to realize that efficiency of operation should

receive some reward. In a recent order of the Nebraska commission it was held that the subscribers had benefited by the high efficiency of management of a telephone company and that such efficiency should be recognized in estimating proper annual dividend returns. It therefore computed the dividend return rate at 10% of the outstanding stock. Orders of this type will go far toward removing one of the criticisms of our present methods of regulation because they do not provide the incentive for economical and efficient operation.

## ADVERTISE IN FARM PAPERS

The problem of the small telephone exchange which has been occupying the attention of telephone association officials during recent years is inseparably bound up with the question of furnishing service to the farm. Wherever the town in which the exchange is located is of sufficient size that the number of telephone in town is equal to or greater than the number of telephones in the farming territory tributary to the town, given anything like ordinary efficiency of management, the telephone exchange can make its way. It is in the smaller centers where the greater number of telephones are located in the country that the major part of the difficulty exists.

It is a known fact that town subscribers are pretty generally carrying part of the burden of cost of operation of country lines because the farmer has not been educated to pay for his service the total amount of its cost—And the farmer is not now being educated as to the cost of telephone service. He is not reached by the shafts of telephone convention oratory directed at dollar-a-month telephone service given by commercial companies and even smaller amounts paid through mutual organizations. The dollar-a-month manager and the mutual company are not present at conventions.

If the farmer is to be educated as to what is good telephone service and what it costs to give such service, a medium must be adopted that will place the facts before him. According to a suggestion recently made by a well informed telephone manager, the medium is printers' ink, and particularly printers' ink that is applied in the production of farm papers. There are many farm papers of nation-wide and statewide circulation and there is scarcely a farm home in the country that does not receive one or more of these papers.

A well organized advertising campaign in these papers could do much toward improving the service and rate situation of the farm telephone. Of course such a campaign is not a matter of individual company effort. It must be done through associations along the lines of the campaigns being conducted in magazines of general circulation by associations in the lumber, cement, brick, sheet metal and similar industries.

As a beginning, it might be undertaken by a state telephone association in one of the agricultural states and could be confined to such papers as are circulated principally within the state. The campaign would have to be financed adequately as there would be costs of preparation of advertising copy which would have to be done by experts and cost of advertising space but such a campaign would, without doubt, justify itself in the improved attitude of the farmer in the matter of paying a fair amount for his service and in his insisting upon a good quality of service.

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## JUNE 2, 1875

Although the official celebration of the fiftieth anniversary of the invention of telephone will not take place until 1926, the date June 2, 1875, is of so great importance that its fiftieth anniversary should not be passed without attention being drawn to its significance in the history of telephony. In the minds of many, this is the true birthday of the telephone, if that important device may be said to have a definite day of birth.

It is true that the telephone did not talk on that date but neither does the human infant produce spoken words on the day of its birth. Months of hard and often discouraging work were necessary before the device was perfected to the point where it reproduced the historic message, "Mr. Watson, come here, I want you."

The significance of June 2 lies in the fact that on that day, the last question as to the possibility of transmission of speech seems to have been cleared up in the mind of Alexander Graham Bell. It has been indicated that the idea for transmission of speech was in Bell's mind for several years but there was always the important question as to whether apparatus could be developed that would respond to the small amount of energy available. When the clock spring of one of his harmonic telegraph instruments was thrown into vibration by the electrical impulses generated by the plucking of the spring on a similar instrument located in another room the last doubt disappeared from the inventor's mind.

# Manual Traffic Studies

## Effective and Economical Switchboard Operation in Manual Offices Requires Complete Traffic Data and Careful Analysis of Load and Service Requirements. How Traffic Studies Are Made

By F. J. DOMMERQUE,
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Although the traffic problem for manually operated exchanges differs more or less from the one for automatic operation these are the same fundamental principles to be taken in consideration, which have been worked out in manual operation many years ago. For this reason the traffic problem for manually operated exchanges may be taken up first, even if it is an old story.

By traffic regulation is understood the efficient and economical switching together of two subscriber's lines for conversation, preservation of the conversation from interruption and other disturbances, and prompt disconnection after the conversation is completed. To accomplish this, sufficient switching apparatus must be provided to make connections without undue delay. Observations have been made from time to time to ascertain the relation of switching equipment and operator's work to calls sent in by the subscribers, which observation served two purposes, first, to adjust the service rendered by apparatus as well as by operators to the load, and, second, to form a basis for ascertaining the future requirements on switching devices.

The observations in the first instance pertain to the number of calls made by the subscribers during each hour of the day. These calls are plotted as a curve which represents the load. A typical load diagram is presented in Fig. 1. Only the part of the day from 6:30 a. m. to 9:30 p. m. is of interest, therefore the remainder of the day and the night is omitted. This diagram is an actual performance in a one-office exchange. There are three curves on the same sheet representing the observations of these week days (business days), which show how near the telephone days are alike. This kind of observations are made periodically, say once a month.

As the kind of call or rather the source or origin of the call affects the operator's work differently for each class, discrimination must be made between calls from flat rate and message rate subscribers, from pay stations or private branch exchanges; also whether they are local, trunk or toll and long distance calls.

### Switchboard Capacity Must Be Ample for Busiest Hour

The load curves show some hours of the day to be the busiest, and these hours are the most important ones, because sufficient switchboard capacity must be provided to handle the traffic at these critical hours; naturally there will be more than sufficient equipment available during the less busy part of the day. These busy hours are also of importance in the determination of the number of operators as the number of calls an operator can handle in the busiest hour constitutes the measure of her work. In the busiest hour the operator is making her best effort and her work is the most strenuous.

Naturally during the busiest hour the greatest number of operators is required and every position at the switchboard is occupied. As the load decreases, operators are dropped off, until at night time a minimum of operators takes care of the switching. Dividing the number of calls in each hour by the number of calls an operator is able to handle, will give the number of operators required at the switchboard at each hour of the day and night. It is the traffic manager's business to adjust the number of operators so ascertained in order to give the operators the longest continuous working time, that is, to arrange the schedule so that each operator does her day's work with as few intermissions as possible. In Fig. 1 an example of operator's arrangement is given.

The calls do not come in uniformly during each hour; there are at intervals spurts when quite a number of subscribers call simultaneously. In order to smooth out such irregularities or rather to dispose of the occasional spurts, the operators do team work, which helps considerably, as rarely will spurts appear in three adjacent positions simultaneously, but to distribute the load upon the operators still more uniformly "ancillary" answering jacks (multipling of answering jacks in several sections) may be installed, which scheme will be of particular advantage in the hours of light load as thereby the operators can connect, where it is the most convenient.

It would be impossible to arrange the equipment so as to have sufficient calls ready all the time for each operator to keep her working at full speed; the strain would be too severe.

### Operator Work Equation

Designating the part of an hour an operator is busy by "A," the number of calls to be handled during the hour by an operator by "C," and the time spent by an operator on each call by "t" in second, the equation $A = \frac{Ct}{3600}$ will give the work of an operator per hour. "t" can be and has been observed from

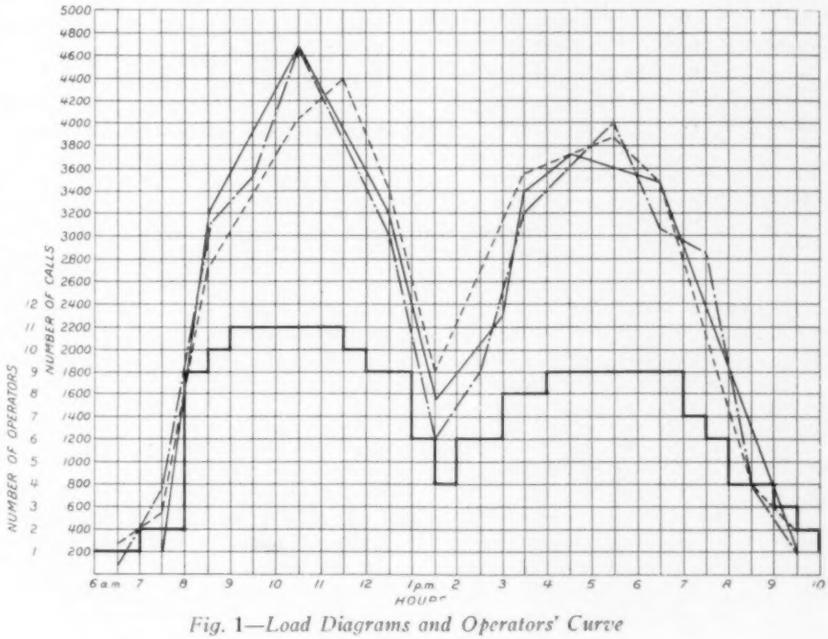


*Fig. 1—Load Diagrams and Operators' Curve*

actual work and equals on the average ten seconds for a call on a common battery multiple board with no trunking; that is, for a purely local call, which may be taken as a unit call. This unit call is presumed to come from a flat rate subscriber, as calls from message rate subscribers, pay stations, etc., take more time on the part of an operator. The following table gives the "t" for other classes of calls, though there may be still other variations.

The volume of operating time "t" for A-operator's work are:

Flat rate—

Common battery local call, no trunking; $t = 10$ seconds.

Local battery local call, no trunking; $t = 16$ seconds.

Outgoing order wire circuit trunk call, 100% trunking; $t = 15$ seconds.

Outgoing ring down trunk call, 100% trunking; $t = 20$ seconds.

Measured rate—

Common battery local call, no trunking, automatic registering; $t = 10.5$ seconds.

Common battery local call, no trunking, ticketing; $t = 14$ seconds.

Local battery local call, no trunking, ticketing; $t = 20$ seconds.

Common battery prepayment coin box; $t = 13$ seconds.

Common battery paystation; $t = 25$ seconds.

Local battery paystation; $t = 32$ seconds.

Toll call (A-board); $t = 12$ seconds.

Toll switching trunk call (A-board); $t = 20$ seconds.

For less than 100% trunking "t" has to be split as follows: For 10% trunking there would be 90% local calls and 10% outgoing trunk calls, hence there would be 0.90 of the "t" for local and 0.10 of the "t" for outgoing trunk calls with 100% trunking; for flat rate, therefore, $t = 0.9 \times 10 + 0.10 \times 15 = 10.5$. For 20% trunking the "t" would be $t = 0.8 \times 10 + 0.20 \times 15 = 11$ and for 30% trunking $t = 0.7 \times 10 + 0.30 \times 15 = 11.5$ and so on. For two kinds of trunking the percentage of trunking would be split accordingly.

The above values of "t" are for the best class of selected operators, trained for the work and well paid, such as one finds in large cities. An allowance must be made for less efficient work.

Automatic listening and ringing on A-boards decreases the "t" by a second or more. If instead of three operators six operators would answer the call, the value of "t" would be decreased by about 6%.

The value of A depends entirely on how heavy one may load an operator, and it is safe to say that an $A = 0.5$ would not strain any operator. The possibility of going higher in the busy hour depends on the quality of operators obtainable, there being a possibility of loading the operator in the busy hour to as high an A as 0.75; however, 0.65 may be taken as a standard for the busy hour, and it may be left to the judgment of the traffic manager to increase the load in the busy hour to the highest value of A he thinks safe; to arrange his schedule he must settle on an A for every hour. If he takes a value of 0.5 for all hours of the day excepting the busy hour or hours (in some places the busiest part of the day or the peak of the load extends over more than an hour, or sometimes is less than an hour in the morning and shows another peak in the afternoon), then chooses the higher value in the busy hour, and probably goes still below 0.5 in the night, he will have arranged his schedule consistently. At night the operators cannot accomplish anywhere near as much work as in the day time, as night work is harder than day work in the first place, and second, the great number of unoccupied positions renders it more difficult to observe signals and make connections.

### Operator Answering Time

The above specified values of "t" and "A" are supposed to permit the operator to reduce the waiting time of calls to such a reasonable figure that the subscriber's calls are answered promptly. Nevertheless, to be sure on this point, regular service tests must be made, and if such tests show too long a waiting time, the A must be adjusted accordingly. The following may serve as a guide for waiting time; that is, the time from taking the receiver off the hook until the operator answers:

Average time in which the operator should answer = 3½ seconds.

Per cent of calls to be answered in 5 seconds or less = 85 for good service and 80 for indifferent service.

Per cent of calls to be answered in 10 seconds or less = 95 for good service and 90 for indifferent service.

Average time in which operator should disconnect = 3.5 seconds for good service and = 4 seconds for indifferent service.

So far no mention has been made of busy calls. It may be taken as a general proposition that as much as fifteen per cent of all originating calls may be busy calls, but as it takes about seven seconds of the operator's time until she reports "busy," the difference in time between a busy call and a regular call is not so great.

For B-operator's load the "t" varies accordingly whether she receives her orders from a small or a large number of offices and how many B-positions there are in her own office. Let M designate the number of officers on one order wire circuit divided by the number of B-positions in the office under consideration, then the values of "t" will be found in the following table. (If there are ten outside offices and four B-positions in her office, $M$ would be $\frac{10}{4} = 2.5$). This table is arranged for two kinds of ringing, hand ringing and ringing by electrically locking keys.

Values of operating time "t" for B-operator's work:

| M. | Hand ringing | Locking key ringing. |
|---|---|---|
| ⅓ or less | 6.15 | 5.15 |
| ½ | 6.30 | 5.30 |
| 1 | 6.75 | 5.75 |
| 2 | 7.75 | 6.80 |
| 3 | 8.75 | 7.90 |
| 4 or more | 9.20 | 8.40 |

For party lines an increase in "t" of about 10% should be made.

Keyless automatic ringing would decrease "t" about 20% from hand ringing. For intermediate values of M the value of "t" is found by interpolation. For incoming ring-down trunk calls $t = 10$.

The slowing down of the operators by party line service may be provided for by district regulation; that is, the operator's load C is decreased by 10 and 20% respectively according to the zones offering more or less party line work.

There may be a decrease in efficiency of the end operators in a multiple board, but in large offices containing a great number of positions this decrease amounts to very little in comparison to the whole; in small offices it is considered as included in the party line drag.

The ratio of calls in busy hour to calls in the entire day varies greatly with the classes of subscribers. The range is from 1/7 to 1/11; the 1/7 holds good for the heart of a city where the subscribers use the telephone for business purposes only, where consequently the traffic is congested into fewer hours, while 1/11 applies to purely residence districts, where the calls are distributed more evenly over the day.

From the equation $A = \frac{Ct}{3600}$ the operator's load is immediately determined as $C = \frac{3600\,A}{t}$; for instance the A-operator's load for an office with no trunking and for flat rate service would be in the busy hour $C = \frac{3600 \times 0.65}{10} = 234$ calls, and in an hour of the day outside of the busy hour $C = \frac{3600 \times 0.5}{10} = 180$ calls.

B-operator's load for an office receiving calls from three other offices and having three B-position of its own would be $C = \frac{3600 \times 0.65}{5.75} = 407$ calls in the busy hour for locking key ringing, and $C =$

$\frac{3600 \times 0.5}{5.75} = 313$ calls in an hour outside of the busy hours. Here $(M = \frac{3}{3} = 1)$.

### The Peg-Count

The calls made by the subscribers are counted periodically, say once a month on a regular full business day by means of counters either mechanically or electrically operated. To record special calls it may be necessary to supplement these counters by slips. The electrically operated counters are similar to call registers and are operated by means of pushbuttons on the key shelves. To check the operators the supervisor can listen in. The counters are read every hour; the operator's hours of working, also the supervisor's hours and the hours of service by the auxiliary force during luncheon and rest hours are recorded and a so-called peg-count computed.

The traffic records are made in "Equated Calls." A traffic unit is fixed as a basis, the unit representing a flat rate call on a common battery multiple switchboard with no trunking. The usual standard is taken as 230 traffic units to one position-hour. All calls other than unit calls require equalizing by multiplying the unit call by a coefficient which expresses the ratio of time required to handle a unit call.

The percentage of trunking, respectively its effect, is taken care of by adding to the equated calls for no trunking such percentage multiplied by a trunking coefficient. In this manner all the data supplied by the regular peg count are transformed into a traffic record composed purely of traffic units which enables easy calculation of cost of handling traffic, the usual basis being the cost per thousand units.

### Operating Cost by Equating Traffic

As an example of determining operating cost by equating traffic the method described by Mr. Clement in his paper on the "Semi-Automatic Method of Handling Telephone Traffic," presented at the Pacific Coast meeting of the American Institute of Electrical Engineers in April 1911, may be briefly cited. Mr. Clement draws two sets of curves, one of which (Fig. 2) gives the multiplier by which the unit call has to be multiplied to obtain the equated call, the multiplier being represented as a function of the percentage of trunking; the other set (Fig. 3) serves to compare the cost of operating per thousand unit calls by manual and auto-manual operation. The two sets of curves are self-explanatory, and are based upon the assumption of four seconds answering service in the manual case and three seconds service in the auto-manual case. These representations should be taken "cum grano salis," as they differ from the experiences and observations elsewhere, but they answer our purpose.

For those who desire to obtain an idea of the difference in calling rate of the various classes of subscribers it may be stated that, as a general proposition, for measured rates the average number of calls per line per day ranges from 12 to 15, according to size of the city, the higher figure pertaining to large cities; on residence lines with measured service 6 to 8 calls per single line per day,

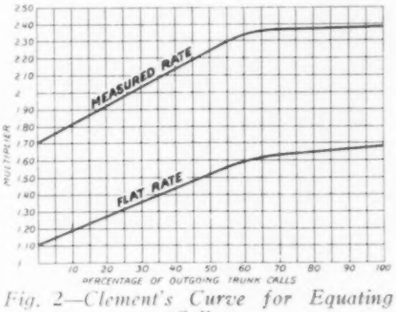


*Fig. 2—Clement's Curve for Equating Calls.*

3 to 4 calls per two-party line per day and 2 calls per four-party line per day. For flat rates the calls are from 3 to 5 times as numerous.

To compute a peg-count of equated traffic the traffic unit of 15⅔ seconds of an operator's time is taken as a basis. This 15⅔ second unit means an operator can handle $\frac{3600}{15\frac{2}{3}} = 230$ unit calls an hour.

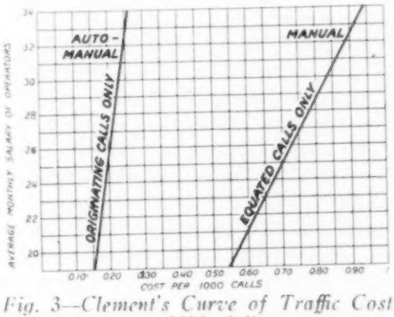


*Fig. 3—Clement's Curve of Traffic Cost per 1000 Calls.*

If in the equation $A = \frac{Ct}{3600}$ or $C = \frac{3600A}{t}$ we make t=10 and A=0.65 we obtain $C = \frac{3600 \times 0.65}{10} = 234$ for a flat rate common battery call, no trunking. This is 4 calls more than the 230 set for standard; this results from the assumption of an A=0.65. If we had assumed A=0.64 we would have obtained 230. If it is desirable to hold to the 230 standard, A=0.64 may be used throughout for the busy hour.

Thus the equated traffic can be ascertained for each class of calls by determining C by the formula $C = \frac{3600A}{t}$. Dividing the C as found from the equation by 230, will give the factor designating the number of units required to handle one call in each class. Multiplying the non-equated calls as ascertained by the peg-count, for each class by this factor gives the equivalent number of units.

To arrange the record obtained by the peg-count on the equated call basis and to compute the data necessary to determine the traffic costs the following series of items may be noted:

(1) General data: subscriber's lines and stations (flat rate, measured rate, pay stations). The corresponding originating calls per day and per busy hour; also originating calls per station per day; incoming trunklines (orderwire circuit trunks, ring-down trunks, toll switching trunks). Incoming trunk calls per day and per busy hour. Percentage of free trunking. Number of A and B positions occupied in busy hour. Total number of A and B operators, supervisors and auxiliary force. Toll lines and out-ticket calls; toll operators, supervisors and toll auxiliary force.

(2) Total number of units in day and in busy hour. Total number of units per position hour for A board, B board and toll board separately and for A+B board, for A+B board+auxiliary force, for A+B board+supervisors+auxiliary force, for toll board, for toll board+auxiliary force, for toll board+supervisors+auxiliary force, for total local board+toll board (all in day and in busy hour).

(3) Units per call for local board and for toll board (out-ticket calls). Total units per call for local board+toll board.

(4) Units per month, A board, B board and toll board. Units per month, A+B+toll board.

In possession of the above information the cost of operating can be determined by means of the payroll. Usually the cost per station, the cost per 1,000 calls, the cost per operating labor-hour and the cost per 1,000 units is figured. In the cost of operating the following items are included: Operators' salaries, clerks, operators' school, matrons, lunch and recreation rooms, rent, supervision and inspection. Of these the operators' salaries constitute roughly 80% and the supervision 10%.

### Toll and Long Distance Costs

To establish any figures generally applicable to toll and long distance traffic is a difficult problem as the conditions vary greatly between different localities. However, to produce some data, whereby toll traffic may be studied, observations should be made and the results collected

in a record, embracing about the following items:

(1) Toll and long distance lines including physical and phantoms, also multiplexed lines. Recording trunks.

(2) Total number of toll and long distance calls and return questions per day and for each hour. Calls completed per day and in each hour of the day. Ratio of total calls and of completed calls per day to total and to completed calls in busy hour. Incoming and outgoing calls should be recorded separately, also return questions.

(3) Total number of operators. Number of operators busy in each hour of the day.

(4) Total and completed calls per line and for each hour (incoming and outgoing separated). The same per position. Observations should be made frequently, or still better, a great number (not less than a thousand) of observations or counts should be made as to the time taken up by each call, and from these observations an average figure should be determined. These records should also be extended to way station traffic.

**Service Tests**

The traffic department's duty is to continually study all possible ways and means to improve the service. There must be a standard for the employes who produce the service, to live up to, and the traffic manager must be in a position at any time to know not only whether such standard is being maintained or not, but also to analyze the traffic and deduce therefrom methods for improvement.

The information regarding the status of the service is furnished by service tests. It is presupposed that the maintenance department, which is responsible for the condition of the line and exchange equipment, is doing its duty and that the traffic department is furnished with all facilities to make its tests. Provision should be made in the first instance inside the operating room for line and supervision tests, so that any line may be switched to a desk where a traffic clerk or supervisor can listen in and make records.

Another valuable institution for observing the performance of the operating force is the service inspection bureau composed of service inspectors headed by a chief inspector under whose direction the service tests are made according to a schedule which is arranged to cover the entire plant by day, evening and Sunday tests. The inspector observes with a stop-watch the time consumed by the operators in performing each operation, principally the answering time, that is the time the subscriber after taking the receiver from the hook has to wait for the operator to answer his call. At a previous occasion the waiting time for good and indifferent service has been stated. Indifferent service designates that the answering time still remains inside the limits of what will be accepted on the part of the average subscriber without causing him to complain. It should be the aim of every traffic manager to never exceed these limits and to make every effort to draw these limits closer so as to obtain what is specified as good service. As an average figure it was cited previously 3.5 seconds for good service. An average answering time of 4.5 seconds should be the limit and should not be exceeded under any circumstances; it is not an unusual feat for a traffic manager to get his average down to 2.5 seconds.

Unfortunately the traffic manager has no direct control over the called subscriber and must trust to his greater or lesser eagerness to answer the call. Automatic periodically repeated ringing always does something to hasten an answer; otherwise the calling subscriber must wait, but he can not blame it on the service when the called party is tardy in responding. Nevertheless, there is also a limit to the time of answering on the part of the called subscriber; for purely local service the average time for the called party to answer may be taken as 18 seconds for reasonable service, and the corresponding limit with trunking as 28 seconds, with a possibility of an average of 12 and 20 seconds respectively for good service. The analysis of answering by the called party should be carried out so as to ascertain the percentage of calls answered in 10 seconds or less, 20 seconds or less, 30 seconds or less, 40 seconds or less and finally above 40 seconds. Perhaps some intermediate steps may be necessary to obtain a complete record.

Of great importance to the service is the disconnect time, over which the operator has full control. As an average figure was cited previously 3.5 seconds for good service and 4 seconds for indifferent service. There are cases on record where the average has been reduced below 2.5 seconds with a percentage of as high as 75 per cent of the calls disconnected in less than 2 seconds. In any case there should not be more than 5 per cent of disconnection over 8 seconds.

As to the time taken by an operator to answer a recall an average reasonable service would be about 4 seconds. For common battery service the average time for initiating a call to the beginning of ringing the bell at the called station is 10.3 seconds (best performance) and 18.5 seconds with 100% trunking.

Observation should also be made of the number of calls and the average time it takes in "can't raise" cases.

Of particular importance are the observations on "busy calls"; not only time and number of such calls are of interest but more so the party whose line is found busy. Such record will often permit the refutation of statements by subscribers that their lines were reported busy when they were not; it may also serve to convince a subscriber that his line is insufficient for the business he tries to conduct over it and that he should install an additional line.

In the operating room proper such tests as supervision tests are made regularly to obtain an idea of the errors and irregularities committed by the operators. The kinds of such errors and irregularities are numerous and cover the conduct of the operator at the switchboard in connection with the subscriber and with other operators. The most common ones are:

Operator asked number more than once; operator repeated number too rapidly; operator failed to await acknowledgment from subscribers; operator answered too slow; operator repeated wrong number; operator answered recall too slow; operator connected with wrong number; operator failed to repeat number; operator failed to repeat prefix; operator failed to repeat properly; operator placed call over wrong order wire circuit; operator failed to make proper busy test; operator disconnected prematurely; operator listened on connection; operator talks to subscriber unnecessarily; operator talked to circuit operator; operator talked to next operator; operator supervised poorly.

The number of calls affected by operating errors and irregularities should never exceed 18 per cent; for good service 12 per cent should be the limit.

## *French Battery in Big Expansion*

Madison, Wis.—A refinancing plan, whereby the French Battery Company will be able to greatly increase the output of that plant has been announced.

Preferred stock will be increased from $700,000 to $1,500,000 and to issue $1,000,000 in five-year convertible six and one-half per cent gold notes. $750,000 of this amount will be sold at once, having been underwritten by Paine, Webber and Company, of Boston and New York.

The reorganization plan which makes the Madison concern one of the largest manufacturers of dry batteries and flashlights in the United States, does not involve any changes in personnel.

In view of the fact that the company has decided to intensify the production of dry batteries and flashlights, the directors voted to drop the word "Carbon" from the name of the company, giving the firm the new title of "The French Battery Company."

Floating of the bond issue will not only provide working capital but will enable the company to expand through additions and improvements to the plant.

# Good Will Is an Asset

## The First Requisite of Successful Public Relations Is a Proper Understanding by the Utility Executive of What Constitutes "Good Will"—A Clear and Concise Discussion of Various Factors

By FRANK E. BOHN,

*Vice President and General Manager, The Home Telephone and Telegraph Company, Fort Wayne, Ind.*

The average individual who seeks success endeavors to gain the confidence, friendship and esteem of his fellowmen. Likewise, the average business corporation endeavors to accomplish the same thing in relation to its customers or the public. "Good Will" is the term that we use in business parlance to describe it.

Good Will may be defined as an asset of priceless value and, therefore, it is found on the asset side of the corporation balance sheet. Although intangible as it may be, some corporations list it in seven figures on their books. While others, such as the General Electric Company, may carry it on their balance sheet as one dollar, they freely admit that this is done for bookkeeping purposes and that they consider their Good Will of a value beyond estimate. There are corporations, such as Postum Cereal, National Biscuit, Coca-Cola, Sterling Products, Household Products, Fleischmann's Yeast, Beech-Nut, and Wrigley, that might be termed Good Will corporations, because they have so well succeeded in establishing their brands in the minds of the buying public through quality, fair dealing, advertising and publicity, that the largest asset they possess is their Good Will, which, it is true in those cases, cost much to gain and is, therefore, quite tangible as an asset, especially when they are able to show substantial earnings that expand from year to year. For instance, some statistician has figured the book value, exclusive of Good Will, of Coca-Cola to be seventeen cents a share, but the stock market thinks quite differently about it, because in 1924 this corporation earned over eleven dollars per share. That is why the stock of this company was traded in on the New York stock exchange at no less than sixty dollars and as high as eighty dollars a share in 1924.

The value of Good Will to any corporation can not be overestimated, but this is doubly true of a public utility, a concern which sells nothing but service. If it is to expand and grow it must have the confidence of the community it serves. Regulatory bodies, in considering rate cases, inquire into the state of the relations between the utility and the public. Bankers who may be interested in its securities and other prospective buyers of its stocks or bonds are ever wont to determine how that utility is rated by its customers and if it is found that cordial public relations do not exist they show little or no interest. A public utility may consider its service the very best, but if the public is unfriendly it is unsatisfactory from the customer's viewpoint.

When the public utilities of this country first began to do business, they were welcomed on all sides, because they offered to supply a service that meant much in comfort, convenience and economy to the community. However, before long they grew in unpopularity, no doubt, due in a large measure to the fact that too many public utility executives did not attach the importance that they should have to the value of good public relations. In fact, some so far ignored it as to give the impression that they were not interested in gaining or maintaining the public's confidence, friendship and esteem. As a result of this attitude by some, the entire industry suffered and for many years the public was wont to look upon a public utility as a soulless corporation, with selfish ambitions and prone to take advantage of the public at every opportunity.

However, conditions have changed materially in the last decade and today we find practically all executives of public utilities doing their utmost to build cordial relations between their companies and the public.

One of the most successful public utility executives recently said, "It does not matter how good may be the property we are operating or how conservatively it may have been capitalized, or how good may be its earnings, unless we can add to that Community Good Will, we are bound to fail."

This is absolutely true, but the converse is also true, that, unless our house is in order, we can not expect to have the good will of the community which we serve. In fact, a public utility, before it can hope to gain the good will of the people it serves, must have, not only an adequate plant with the best of facilities operated properly by thoroughly trained technical men and women, but also an organization of human beings who know human nature and who can be said to be happy and satisfied employes and officials; who not only know their business but are loyal to their company and informed as to its practices, policies and ambitions and endowed with a spirit of service, especially impressed with their individual responsibilities in the work of their company in rendering a satisfactory service to the public.

Because a public utility is more subject to political attack than the average corporation, the question of building and maintaining cordial public relations may be considered of even greater importance than in any other business. The demagogue, ever alive to any situation that will aid him in the furtherance of his selfish interests, sees in the public utility his opportunity. Regardless of the truth and depending for success upon an audience uninformed as to the facts or ignorant of the true conditions, he directs his unscrupulous attacks against it.

He finds in the public utility something in which everyone is vitally interested, for, by the very nature of the service it sells which is used constantly by almost everybody, the public utility is related more closely to the public than any other corporation. In most communities it has a monopoly of the business and, although it has been proved that this is the only economical solution, people in general look upon any monopoly with distrust, which distrust the demagogue recognizes as fertile soil for sowing his propaganda. He knows, too, that it has its property anchored right in the streets and alleys, which would be worth nothing but junk if it decided to "pull up stakes" and move away to some place where it might receive more considerate treatment, and so it must remain and "take its spanking." However, the utility that has the public's good will has nothing to fear, for it may invariably depend upon that public's coming to its rescue.

So we see it is quite essential in the public utility business that we build and maintain cordial public relations. There is no public utility executive today who will contradict this statement.

How, then, do we build and maintain such relations? Assuming that we have our "house in order," that is, that we

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have a well trained organization, ambitious to render a most satisfactory service, we must depend, first, on the contacts of our employes with the public. These contacts may be divided into three classes, namely, the face-to-face contact, the voice-to-voice contact, and the contact by means of correspondence. Each plays its important part, but should be augmented by publicity and advertising in the newspapers and other mediums, talks before clubs and public gatherings of all kinds, etc. Last, but by no means least, employe stockholders and customer owners play a most important role.

Pre-eminent in importance in this business of building and maintaining good will is the individual treatment each employe gives to every customer with whom he comes in contact. It is he or she who can make friends innumerable for the company by extending courteous, considerate treatment and seeing that the customer's wants are properly, fairly and adequately looked after. Thus the man or woman behind the counter and at the cashier's window, the collector, the installer, the operator, the motorman, the repairman, the inspector, all are in an enviable position to build and maintain for their company cordial relations with the public, for by what they say and do the company is judged.

The correspondent, too, no matter whether he or she be an official, a clerk or a stenographer, can accomplish much. In fact, it appears at times that some of us may have overlooked the possibilities of building and maintaining cordial public relations through the medium of the mail, or rather our letters. Obviously, more care should be given to our letters than to face-to-face conversation. Too often there is a temptation to express thoughts in a letter that would never be uttered in face-to-face conversation, or to be too brief or businesslike. It is not necessary to ramble or wear out the reader with nonessentials, but full explanations should be given, mistakes frankly admitted and requests in a spirit of fairness courteously made. Letters written on neat, clean stationery in plain conversational English, free from all meaningless forms and set phrases and in a straightforward, coherent and concise manner, go a long way toward building good will.

A prompt answer to every letter also makes friends for the company. If it is impossible to give a prompt explanation in answer to a complaint, a letter of acknowledgment should be sent to the complainant promising that the matter will be investigated and a full explanation made just as soon as the facts can be ascertained. In the same letter he should be thanked for calling attention to his trouble or grievance and assured that it will receive the attention that it deserves. A business letter is today regarded as the personal representative of the company—hence its importance. The correspondent, too, is offered many opportunities to enlighten those to whom he may have occasion to write on the company's methods, policies, ideals, aims, ambitions, problems and achievements.

What about the man or woman at the telephone? The employe's voice is regarded by the listener at the other end of the line as the firm's voice. A pleasant, friendly smile in the voice, an inteligible answer, prompt and courteous attention will accomplish much. The telephone today, because of its universal use, is a most vital factor in our relations with our customers. Yet there is something about the telephone that makes men revert to type and monosyllables, to forget their good manners, to ignore the most simple rules of polite behavior and to fail to realize that there is such a thing as courtesy. Employes should be trained, therefore, to greet the customer at the end of a telephone just as they would greet him face to face; trained to acquire the "telephone voice," as the telephone operator in a modern exchange; trained to put gestures, facial expressions, kindliness, friendliness, interest and the intended meaning into the voice. The wrong expression or an irritating, rasping voice over the telephone may produce a feeling of hostility or indifference that may destroy efforts in other directions in the field of public relations.

Too much stress can not be placed on the value and importance of a carefully trained, well informed, courteous, patient and pleasant private branch exchange operator. She is in a most peculiar position to make friends for her company by the manner in which she conducts herself when handling and dispatching the many calls that naturally come over the telephone to the company's offices. If she is overloaded with other duties or chosen because she is a good typist rather than a trained telephone operator familiar with the company's business, its departments and personnel, much should not be expected from her as a good will builder. In fact, she probably, unknowingly, will tear it down.

Courtesy is a most efficient good will builder. Nothing can destroy good will more quickly than discourtesy. Some one has said that politeness is only the possession and expression of good manners, whereas courtesy is a real consideration for others rather than a mere expression of forms of consideration. Courtesy, therefore, comes from the heart; it rings with sincerity, it is politeness originating in kindliness. Courtesy should not be confused with flattery, servility and obsequiousness, nor with being weak or unnecessarily apologetic, but it does mean having and displaying due regard for the other person's viewpoint, difficulties and position, giving due consideration to the circumstances surrounding the particular case, and showing a desire to be fair: all of which means being tactful and gracious under all conditions.

In the public utility business, many seemingly disagreeable things must be done. Money must be collected, credit refused, complaints adjusted, favors asked and refused, etc. The proper friendly relations can be established if tact and courtesy are employed in handling these as well as all other such matters. There are times, of course, when one must be straightforward, frank and to the point, but this does not mean that one can not be so and at the same time be courteous and tactful.

The person making a complaint always thinks he has just grounds for doing so, and, in most cases, he has. Therefore, it is quite essential to get his point of view in all cases and not assume that he is trying to fool somebody. He may exaggerate, it is true; he may be misinformed as to certain facts; he may be ignorant of others; but possibly we might, too, if we were in his position. Hence, it is always well, when possible to do so, to handle and adjust a complaint with oneself in the other's shoes. In other words, the employe or officer should place himself in the position of the complainant and endeavor to handle the situation from that viewpoint.

Every well managed public utility has a department to which complaints may be referred, where they are followed up and where employes who come in contact with public are instructed. This is quite an essential requirement as a means of maintaining and building good will and its importance should not be overlooked. The only thing we, in the public utility business, have to sell is service. Service is a broad word and in our business it covers not only the transporting of passengers and freight promptly to their destination, the building of a switchboard connection for telephone conversation, the making it possible to turn a switch and receive light or power, to turn a lever and strike a match to light a flame that produces an ample supply of heat, or to turn a faucet and receive an adequate supply of pure water. But it covers more than these, for it embraces all of our dealings with the public. The customer who receives an incorrect bill, experiences undue delay in having his wants attended to, suffers unnecessary interruptions, indifferent, inconsiderate or discourteous treatment, etc., is not receiving good service.

It is the aim, therefore, of the present day public utility executives to satisfy

their customers in all of their relations with the company. Each is worth treating right and keeping in the proper frame of mind. The public as a whole wants justice. Statistics show, and it is a conceded fact, that most people are honest and want only a square deal. Given a square deal, courteous treatment and good service, the public will reciprocate with its good will.

However, there are in the public utility business so many things that may be misunderstood and misinterpreted by the public or of which the public may be ignorant or misinformed that it not only behooves each employe to bear this fact in mind in his relations with the public, but, if the most in public relations is to be gained, we must employ such means as publicity, advertising, talks and demonstrations before clubs, civic bodies and the like, and periods of open house when the public is given the opportunity to see the "inner workings" of the business, to augment the efforts of all to this end.

The only legitimate purpose of a political campaign and the only ground upon which it may be justified is to enable the voter to become intelligently informed in order that he may exercise his sound judgment and not be misguided through prejudice, passion, half-truths or more zeal than knowledge. If a political campaign could be conducted solely along constructive lines for this purpose, the results would well justify its existence, for we may always depend upon the sound judgment of the majority, provided we may interest them enough to assert their right of suffrage.

President Coolidge, in his radio talk on the eve of the recent election, said, "Our country is always safe when decisions are made by a majority of those who are entitled to vote. It is always in peril when decisions are made by a minority." This, of course, we are all willing to admit, is axiomatic. It is also true that the public utility that conducts a campaign of publicity and education, taking the public into its confidence and fully informing it as to the business, all cards being placed face up on the table, has little to fear and may depend upon the majority to come to its rescue if it deserves it when the auspicious occasion may require it, because, given the facts, the public may be depended upon to be ninety per cent right. We can not hope to convert the demagogue, the crank and the unduly selfish individual, but they are far in the minority and may be little feared if the majority is properly informed.

Such a campaign should be continuous in its efforts and varied in its intensity according to circumstances and should employ every legitimate means of reaching the utility's customers. The public should be told and retold in all candor and in language that it can understand, as much about the business as it will absorb. Things that it is interested in and practices of the utility that it comes in contact with and may misunderstand should be made intelligible. Policies of the company that need explanation should be interpreted and given the publicity they deserve. The plans, aims, ambitions and ideals of the management in the interest of good service should be made clear. Telling frankly of the company's problems and achievements should not be overlooked. Costs should be explained in full and expenditures for extensions or improvements announced and interpreted. Regulation should be described in detail. Practices, rulings and orders of courts and commissions should also come in for their share of discussion. In fact, the more the public knows of all these things, the better conception it has of the important position in the social and economic life of the community that the utility occupies, the more satisfied it will be; and, given good service by a well trained organization of human beings, the utility may depend upon having its good will.

General and nation wide campaigns of advertising such as that of the Western Electric Company, in which the public is told certain pertinent facts about the electrical utilities in particular and others in general, have gone a long way to help bring about a better understanding of the utilities by the public. Other manufacturing companies, such as the General Electric Company and the Westinghouse Electric and Manufacturing Company, have likewise done much good in a similar way. What the American Telephone and Telegraph Company has been doing for fifteen or more years to tell its story to millions of magazine and newspaper readers (the public) has helped not only the telephone industry but other public utilities as well. How few of us have not read of its ideals, its problems and its achievements. We, all, have learned to respect and admire the Bell Telephone System.

Employe stockholders and customer ownership have done much to build good will for public utilities.

It is quite obvious that ownership of stock in his company by the employe gives him, among other things, a greater opportunity and desire to become acquainted with the company's business, policies, ideals and practices; makes for loyalty and confidence, stimulates efficiency and happiness in his work, and inspires a spirit of service. Such employes, naturally, help much in building and maintaining good will. The knowledge also that the utility has a large number of employe stockholders encourages public confidence in the company, which is good will. For instance, the American Telephone and Telegraph Company has 65,000 employe stockholders and 100,000 other employes who are acquiring its stock on the partial payment plan.

The movement by many utilities to obtain a wider distribution of their stocks and securities by making it possible for their customers to purchase them in small blocks for cash or by payments over a period of time has done much to build community good will. Obviously a utility that is owned by a large number of stockholders who live in the community it serves has a host of friends who are interested in its success, who want to be informed about it, and who are ever jealously watchful of its interests. Public utility executives recognize these facts and for the past several years have made great strides in customer ownership. The plan of the American Telephone and Telegraph Company to get each telephone subscriber to purchase for cash or on the partial payment plan enough of its stock, the dividends from which would pay for the telephone service, has met with such universal success that today it may truthfully boast of 350,000 stockholders scattered all over the country as friends of the telephone.

So the problem of building and maintaining cordial relations between the public and the utility is two-fold. First, we must have our "house in order" in every sense of the expression and, then, we must leave nothing undone to educate and inform our customers (the public). Its solution requires the hearty co-operation and untiring efforts of every one in the organization, from the top to the bottom, but it brings results of a permanent character and tangible value. Besides, the joy of human relationship and the knowledge of the possession of cordial friendships constitute, perhaps, the greatest satisfaction in any business and truly make one's job a genuine pleasure.

## *Oklahoma Telephone Meeting, Sulphur, June 26-27*

Sulphur, Okla.—A committee consisting of E. J. Boase, E. F. McKay and H. W. Hubenthal of the Telephone Division of the Oklahoma Utilities Association is arranging for the 1925 meeting at Sulphur, June 26-27. The committee invites suggestions from Oklahoma telephone men relative to the program.

Platt National Park is located at Sulphur. This national playground is expected to serve as a magnet in drawing a big crowd to the meeting which is scheduled for Friday and Saturday, so convention attendants can put the following Sunday to good use enjoying the park.

# Some Tips on Conduit Work

## Details of Manhole Construction Are Given—Drawing in and Handling Cable—Supporting Cable in Manhole—Special Devices for Pulling Cable—Underground Conduit Maintenance

By P. KERR HIGGINS

Manholes for telephone conduits may be made either of brick or concrete and are usually about six feet deep and four feet wide, the length depending upon the location and number of ducts. The bottom of the manhole should be cemented with from six to eight inches of concrete, consisting of one part cement, three parts clean river sand and five parts broken stone. On top of this should be placed a surface dressing of not less than one-half inch thick of one part cement and three parts river sand. In the center should be placed a drain pipe connected to the sewer. The ducts should be located about four feet from the bottom of the manholes. The roof may be made of reinforced concrete of the brick and railroad iron; the former being preferred. The top or entrance to the manhole is closed with an iron cover, which is removable. A large number of holes are provided in the cover for ventilation.

The choice between brick and concrete will depend largely upon local labor conditions and the cost of the available materials. In locations where the use of standard concrete forms are impracticable, brick is the only alternative. It is always well to construct regular or standard shaped manholes wherever possible to do so, even if necessary to slightly curve the line of ducts to accomplish this object. Manholes are usually made oval or egg-shaped in plan, flattened at the end where the ducts enter. This shape gives greater strength to resist side pressure. The manhole wall should be dug vertical and smooth down. Clean all around the entering conduit so that the wall of the manhole will form a union with the concrete on the conduit. If sewer connections are to be made, place drain trap and enough section of the sewer pipe to reach the outer wall of the manhole. If no sewer connections are made, then the floor of the manhole should have a depression sunk in it so that a pump may be used to remove any water that might accumulate. The entering conduit should be arranged with a flare formed out of the concrete. Circular lids or tops are considered preferable as they are less liable to damage or causing damage to the cable by dropping through the manhole.

*Author's Note—In the previous article, we discussed the manual digging of trenches for conduit. The larger companies are now doing this digging by machines. Fig. 1 shows such a trench digging machine used by the Southwestern Bell Telephone Company in St. Louis, Missouri. Fig. 2 shows the type of machine used for cutting the pavement. These machines speed up the work considerably and show a handsome saving in cost where the job is large enough to warrant their use.*

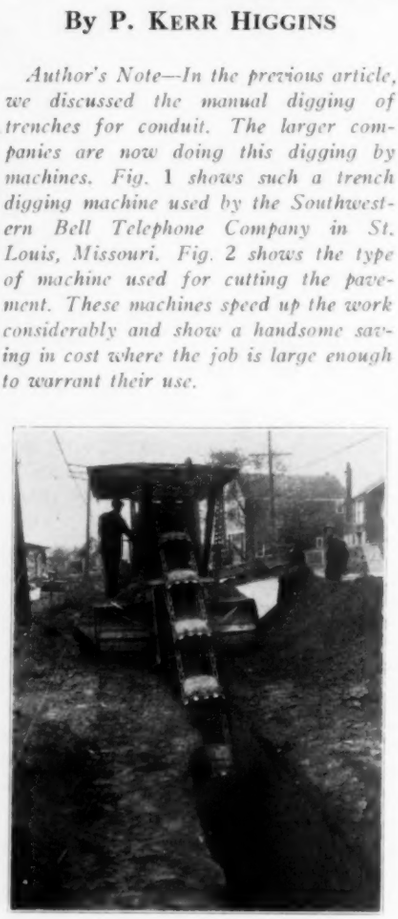


*Fig. 1—Surprising how much digging machines cut construction costs. Although this one is in Southwestern Bell service there are many smaller companies employing such machines economically.*

*Fig. 2—When there's much paving to be cut up the work is thriftily done mechanically. Note the popular Fordson.*

### Manhole Construction

The excavation for a manhole should be made to such a depth as to bring the brick or concrete top 17½ inches below street grade. In brick manholes, the excavations should be sufficiently wide and long to leave a space of 6 inches around the outer wall of the manhole when completed. The hole may be dug inside a templet, constructed as shown in Fig. 3. In stiff clay the excavation may be made of the outside dimensions of the manhole. In brick manholes, the wall of the manhole should be built of hard burned sewer brick laid in cement mortar. The walls should be 9 inches thick and built up to the required height with every sixth course laid as headers. The top course should be laid as stretchers. The horizontal mortar joints should not exceed one-half inch and the vertical joint three-eighths inch in thickness. The brick work should be flared around the entrance of the ducts to afford room for turning cables when pulled in. All pipes entering manholes should be well cemented into the brick work, and the inside of the manhole wall well pointed up.

The walls of concrete manholes should be six inches thick, should be uniformly and equally distributed within the forms and thoroughly tamped in place. After the wall of a manhole is finished and the earth filled around the outside, the wood form for the concrete top may be placed. This form should be so arranged as to make the center of the manhole opening as nearly as possible over the center line of the ducts going both ways, and half way between the ends of the manhole.

Manholes are provided with cast iron heads which are placed or seated on a brick or concrete collar and laid on a bed of cement mortar and when in final

position the top of the head should be flush with the grade of the street. Where brick is used, the manhole head should be seated upon a collar of brick at least three courses in height built around the opening in the manhole top to facilitate retarding. In Fig. 4 is shown a standard 2-way oval shape manhole. Three sizes are used, the dimensions of which are given by the table at the bottom of the figure. Plans for the wooden forms are given in Fig. 5. A standard rectangular type manhole is shown in Fig. 6.

Where the use of a large manhole is not necessary, small hand holes are often provided for testing, examination or repairs. In case laterals to poles or buildings are of such length or curvature as to prevent the pulling of lateral cable in one length from the manhole to the pole or building, hand holes are frequently located and their construction is usually that of manholes in miniature. Two types of hand holes are shown in Figs. 7 and 8. Where junctions of conduit from three or four directions occur, special forms of manholes are used.

### Brick and Brick Work

A working knowledge of brick and brickwork is frequently a good asset to the construction man working on underground work and the following may be of some service to him in the performance of his duties. The brick usually used for manholes is the common hard burned brick, often referred to as sewer brick, because this brick is used for building sewers and sewer manholes. Brick may be made out of any plastic clay, the kind and nature of the clay determining the quality of the finished brick. Common brick usually consists of a mixture of clay and sand to which coal and other foreign substances are usually added. The clay properly prepared is moulded and dried either in the open air, in steamheated drying houses or on hot floors. They are then burned in the kiln. The moulding of the brick may be done either by hand or by machine. There are three types of machines which are frequently used, namely, the auger, the plunger or a combination of these. In the first of these the clay is forced through a die by a series of knives arranged spirally on a horizontal shaft. The clay emerges from the machine in the form of a continuous bar, when it is cut into shape by steel wires operated either manually or automatically. In the plunger machine the clay is forced downward into a chamber from which it passes through a die by the action of a reciprocating plunger or piston. It then passes from the die to a board where it is cut into bricks.

The handmaking process is extremely simple, the clay being thrown into a circular pit where it is mixed with water and tempered with a special wheel until it is soft and plastic. It is then pressed into moulds dipped in water or sand, the former being called "slop-moulding" and the latter "sand struck." The bricks are left in a dry house or in the sun for three or four days when they are transferred to the kilns and burned from six to fifteen days, varying according to the

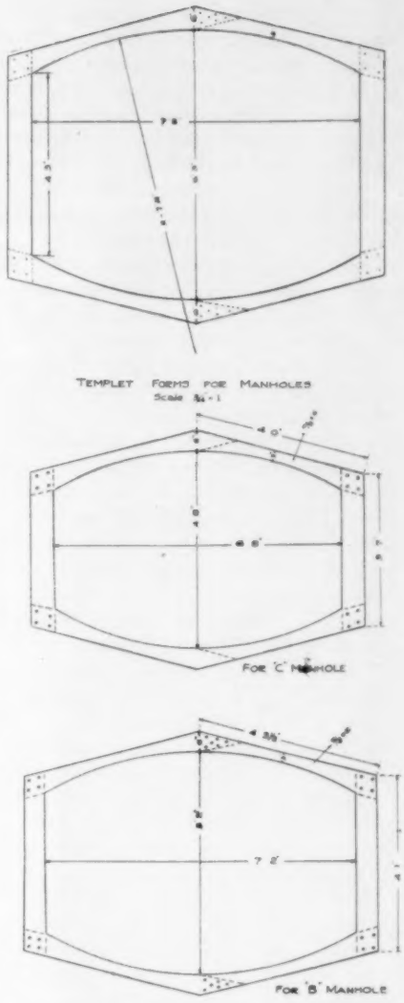
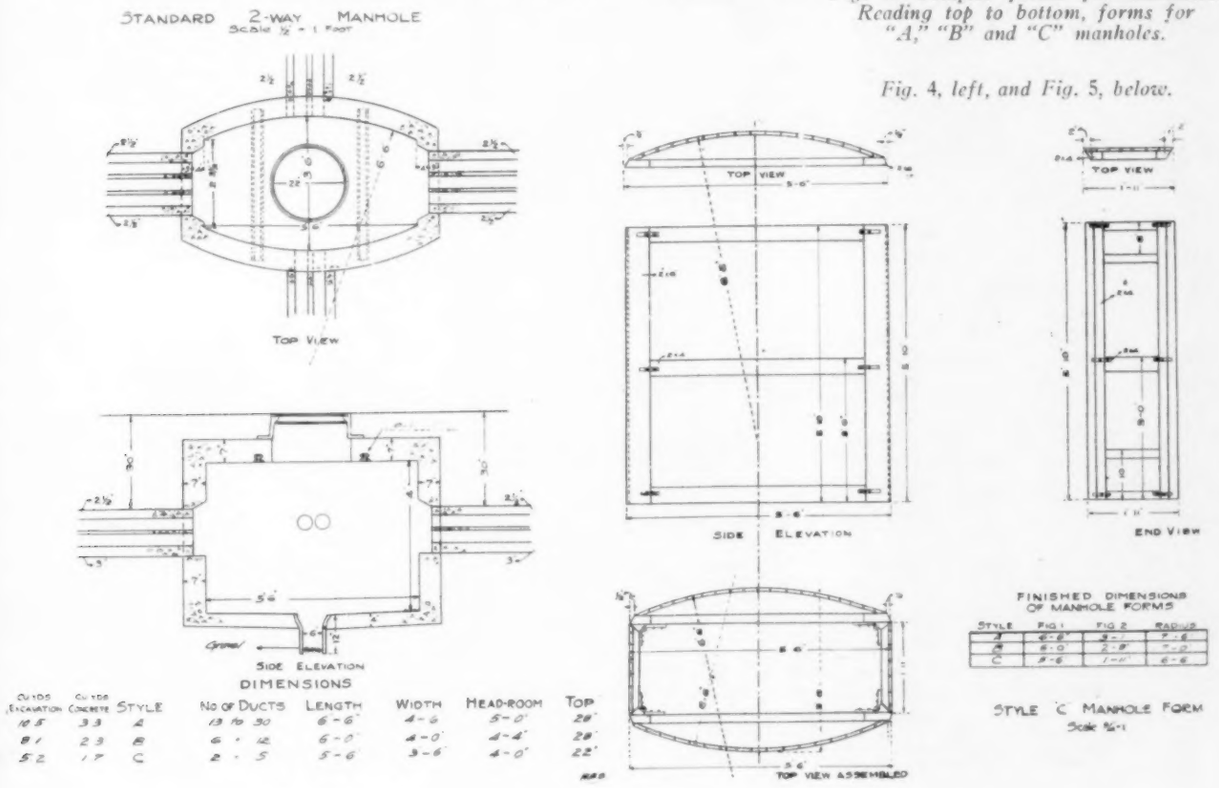



*Fig. 3—Templet forms for manholes. Reading top to bottom, forms for "A," "B" and "C" manholes.*

*Fig. 4, left, and Fig. 5, below.*



type of kiln and the fuel used. Bricks made in the old style kilns are of three classes, arch, red and salmon or pale. Those located over the arch and being near the fire are usually heated to a high temperature and vitrified; hence the name arch or hard brick, and they are very strong if not too brittle. The red or well burned brick constitute about fifty per cent of the bricks in an ordinary kiln. The balance are usually the top brick and are too soft for heavy work. Recent improvements in brick working reduce the number of classes or grades to two, namely hard and soft, and subdivided into firsts and seconds. The color of brick is determined largely by the temperature to which the clay is heated and its composition. The color of white bricks is usually due to the presence of lime. The presence of iron produces a tint varying from yellow to red, depending upon the percentage of iron. A composition of iron and lime produces a cream or light drab color. Magnesia produces a brown color and in combination with iron, a bright yellow. The dimensions of brick are usually two by four by eight and a quarter inches and the average weight four and a half pounds each. A sound well burned brick will give out a clear ringing sound when struck with another brick or with a trowel. A dull or hollow sound indicates soft brick.

The combination bricks and mortar is given the name brick work. The strength and durability of the combination depends very largely upon the quality of the mortar and the brick. Only cement mortar should be used in underground work. If laid too thick, it will weaken the wall; if laid too thin, the joint will not be completely closed with mortar. Hence the requirements of one-half inch for a horizontal joint and three-eighths for a vertical joint. With less than these requirements, the joint is liable to be filled with small holes. Dry or porous brick will absorb the moisture of the mortar and prevent it from setting properly. Hence, brick should never be laid dry except in freezing weather.

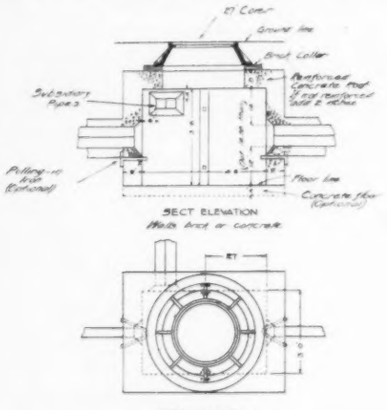



*Fig. 8—Hand or service hole. Two-way rectangular for distributing. Type A.*

NOTE—Dimensions not to be less than given. Place pulling-in iron opposite subsidiary pipes if necessary. Sewer connection only when specified.

In hot weather it is almost impossible to get the brick too wet. Newly laid brick should be protected from rain as the joints are likely to be washed out.

### Drawing in Cable

The number of duct having been assigned, the duct should then be rodded. To the end rod is attached a length of No. 12 steel wire, which is used to draw the rope into the duct. The end of the rope is then fastened to the cable by means of a cable clamp, wire hitch or other suitable device. The reel should be set up as nearly in line to the duct as possible and on that side of the manhole at which the cable enters the duct, thus allowing the cable to enter the manhole from the top of the reel, thereby providing a simple curve from the reel to the duct and avoiding danger from bends or kinks. The skids and sheaves rigged as shown in Fig. 8 should also be set up as nearly as possible in a line from the mouth of the duct. The cable may be pulled in by power or by hand or a team of horses as may be convenient or practical. Great care should be taken not to pull a cable too fast or stop it too quickly. A cable should also be thoroughly lubricated with soft soap or axle grease. This is very important and necessary except in the case of short lengths of not over a hundred and fifty feet. A man should be located to examine and inspect carefully the cable as it passes from the reel into the ducts and also as it leaves the ducts. In pulling lateral cables through sewer pipe, the pull should be against the bell of the pipe to avoid breaking the joints.

### Handling Cable

When ordering underground cable, great care should be taken to allow enough slack for splicing and supporting on the walls of the manhole. It is sometimes good practice to leave a few feet of slack in the manhole on lateral cables to permit of future rearrangement of distribution. In the handling of cable great care should be taken to avoid all kinks and bends. The entrance and exit of underground cables into the conduits should be sealed with plaster of Paris to prevent the passage of gases into buildings,

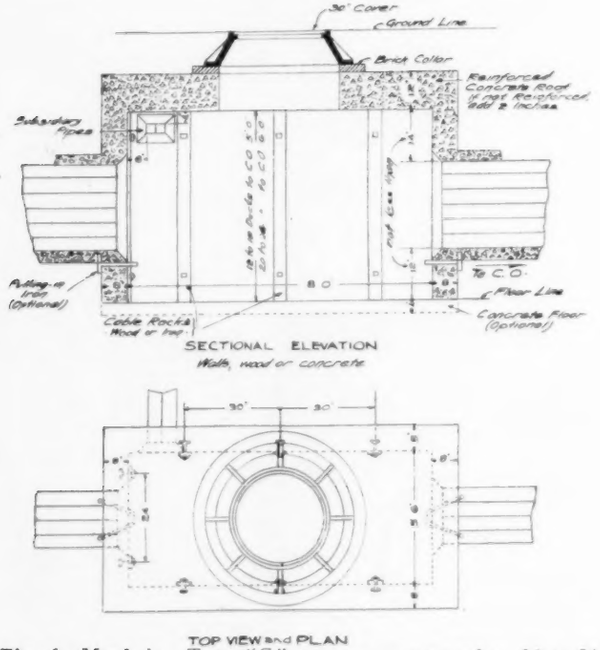



*Fig. 6—Manhole. Type "C," two-way—rectangular. 16 to 24 ducts.*

NOTE—Dimensions are not to be less than given. Place pulling-in iron opposite subsidiary pipe if necessary. Sewer connection only when specified. For double racking add 10 inches to width.

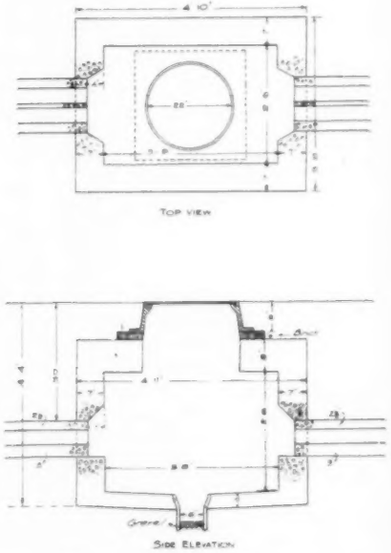



*Fig. 7—Standard Handhole.*

etc. Lead cable is shipped from the factory in wooden reels of suitable size to accommodate the cable. As a general rule aerial cable has a small percentage of antimony or tin while pure lead sheath is generally used in underground work. When coiling a cable on a reel the first or test end is put through a slanting hole in the reel. This enables both ends of the cable to be exposed for testing purposes at the factory. When the testing is completed, the ends are hermetically sealed up and all ends should be kept in this condition when not in use or not expected to be used immediately as paper cable is very susceptible to the abosrption of moisture. The cable reel is lagged from flange to flange with heavy wooden slats, securely nailed to the flanges so as to protect the cable from outside injury in shipment.

When necessary to transport cable from point to point, a low wagon or cable cart should be used wherever possible to do so. When necessary to raise or lower a cable reel containing cable from a high wagon or car, the work must be done very carefully and preferably by means of a windlass or skids or some similar manner so that the reel is not allowed to strike the ground suddenly. To avoid the loosening of the cable on the reel, the reel should be rolled in the direction indicated by the arrow painted on the side of the cable reel. In placing the reel in position great care should be taken to see that the cable will unwind from the top of the reel. An iron rod or bar is usually passed through the hole in the center of the cable reel and the reel hoisted or raised by means of screw jacks or some other device that will permit the reel to revolve freely. Until this has been done the lags should not be removed. All nails and fastenings for the lags should be removed so that there will be nothing on the flanges to injure the lead sheath.

Because of the peculiar conditions in underground work and the numerous obstructions met with the utmost care should always be taken not to bend the cable sharply, break, abrade, cut, kink or dent the lead sheath and the ends should always be kept carefully sealed. Failure to observe these points may lead to injury of the cable and needless expense and delay. The useful life of lead cable is usually dependent upon the insulation of the conductors enclosed in the sheath; hence the necessity for keeping the lead sheath hermetically sealed and free from moisture at all times.

### Supporting Cable in Manhole

In order that the cable splices may be easily accessible for repairs and inspection, main underground cables are racked singly wherever practicable and are arranged around the sides of the manhole where this can be done; otherwise they go straight through. In some cases it is necessary to rack two cables abreast, but not more than two should ever be racked on the same horizontal support. All cable splices should be supported at each end of the splice. As a general rule lateral cables should be taken out at that end of the main splice which is most distant from the lateral duct opening. The lateral cable should wherever practical be placed or laid along the main cable and near

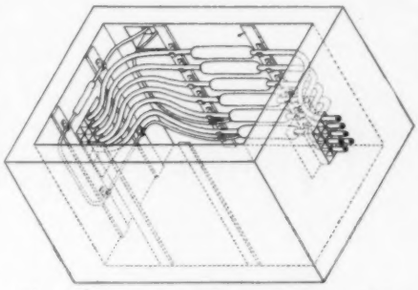


*Fig. 9—Arrangement for racking cables in two-way manholes.*

NOTE—Cables on opposite wall of manhole are racked the same as those shown. For manholes with three cable supports on side walls, splices are to be staggered.

the junction of the top and manhole side. This will provide slack cable for future changes. When impossible to place the lateral cable near the top of the manhole it may be carried on the sidewall near the bottom. The object in both cases is to permit of leaving a few feet of slack as already explained. The general arrangement of main and subsidiary cables is shown in Fig. 9.

Experience has shown that the frequent opening of splices on large cables results in defective or lost pairs and low insulation. Hence where cables larger than two hundred pair are installed it would seem advisable to place short stubs at each splice where several lateral cables are taken out or where it can be foreseen that this might be done. In this way the opening of the main splice to make transfers or changes can be avoided. All main cables should be supported by means of racks or hooks. All lateral cables should be supported with lead cleats or their equivalent placed on thirty-inch centers.

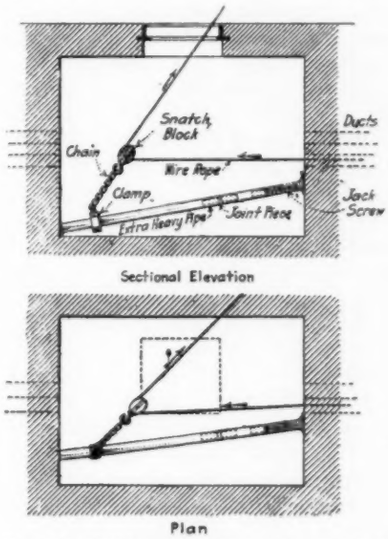



*Fig. 10—Cable-pulling brace in manhole with offset ducts or opening.*

### Special Devices for Pulling Cable

A motor capstan is probably one of the latest and best devices for pulling in or erecting cable. The machine is quite simple to operate and takes but a few minutes to set up. By using this method there is no jerk on the cable and pulling can be stopped within an inch by allowing the cable rope to slip on the drum, there being five turns of the rope on the drum, while the other end is held in the hand. The capstan may be operated either by a motor, using power from the trolley or some other mechanical means. The cable pulled in a full working day by this means was 9000 feet as compared with 2000 by the old hand capstan method, six men being used for drawing in the cables. The pulling rope used was ⅜ inch steel and made with a soft core.

Another device that has been used and which has been found very convenient is known as the cable pulling brace. It is sometimes necessary in building a manhole to place the opening at one side or offset from the line of conduit. Such construction presents difficulties in the pulling in of cable. The sheave strand ordinarily used to guide the wires pull-in-line, cannot be placed so that the pull will be straight out of the duct. Hence the necessity for some special means for holding the sheave block down in the manhole so that the pulley is in the right position for a direct pull. To overcome these obstructions, the Commonwealth Edison Company of Chicago have constructed a cable pulling brace, the use of which is shown in Fig. 10. This brace consists of four pieces of extra heavy three-inch iron pipe, two feet, three feet, four feet and five feet long, which may be joined end to end to make a brace of approximately any length from four to ten feet. The pieces are fitted snugly together by means of a splicing piece which slips inside the three-inch pipe and is made from two and a half-inch extra heavy pipe with a collar fastened at its middle point by means of four screws. A screw jack may be fitted on one end of the brace, thus permitting finer adjustments in the overall length. A heavy clamp adjustable to any position on the pipe holds a ring into which a chain may be hooked and attached to a snatch block. To use the brace it is placed in the manhole with its length parallel to the direction of the pull and braced against the walls. It should be set in a slanting position with the clamp fastened near the lower end, so that the upward pull will tend to tighten the

brace in its position and also put the strain near the end. Prior to the use of this device, U-bolts were used in the walls of every manhole and as a general rule the expense of these was quite great and frequently they were not in the right place and there was constantly a liability of tearing out the wall.

**Underground Conduit Maintenance**

A regular inspection of manholes, covers, cables, hangers, etc., should be made at least twice each year and a record kept of such inspection so that any irregularities found may be promptly cared for. This inspection may be done at the same time that the tests for electrolysis are made. Tests should be made to determine the presence of sulphurated hydrogen gas, the following method being frequently used.

Dip a sheet of white blotting paper into a solution of acetate of lead, sometimes known as sugar of lead. This is lowered into the manhole by means of a piece of string. If gas is present the blotting paper will immediately turn black. The presence of this gas and illuminating gas may also be detected by the smell. Before

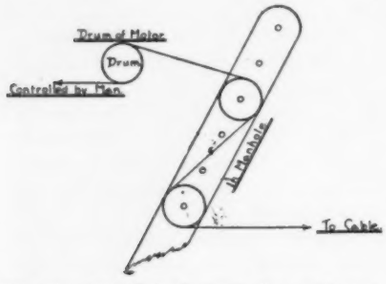



*Fig.* 11—*Method of arranging cable rope.*

working in a manhole, care should be taken to determine whether or not gas is present before striking a match or taking a torch into the manhole or even entering the manhole, as gases when mixed with air in certain proportions, about one to eight, are very explosive. If gas is present, thorough ventilation is necessary before entering.

The following are some of the methods used for ventilation:

1. Stretch a cloth screen across the top of the opposite side of the entrance to the manhole to that from which the wind is blowing. By striking this screen the wind will be deflected downwards creating an eddy current to drive the gas out.

2. Divide the manhole into two parts by means of a cloth screen large enough to reach from the roof to within six inches of the floor. Lower a pail of hot water to the bottom of the manhole on one side of the screen. This will have a tendency to warm any foul air that may be present and cause the foul air to rise while the colder air from the other side of the screen will enter and in turn be warmed and rise.

3. Pump the gas out of the manhole by means of an umbrella-shaped contrivance forced up and down through the mouth of the manhole. The impure air will be lifted out and the pure air gradually take its place.

Should it be necessary for a man to work in a manhole where sewer or other gas is likely to come in upon him, he should have a rope fastened around his arms and connected with the surface so that his helper can remove him quickly should he be affected by the gas. Open manholes should always be protected with a manhole guard to prevent accidents. Manhole covers must be watched and broken ones replaced immediately. As damage due to street improvements, etc., are very likely, hence constant watchfulness and immediate attention must be given where excavations are likely to damage the conduit. Broken pieces of clay conduit can be replaced or repaired by means of split duct. After repairs in manholes all scrap and other debris should be removed, the scrap, lead, and copper wire being sold as junk.

# Up-State in Live Session

## New Yorkers Re-elect Fuller Chief at Annual Meeting

Rochester, N. Y.—The telephone industry as a whole has never been in better condition than it is at present, nor has its operation ever promised greater progress and prosperity. This, in my opinion, is due largely to the fact that more and more the public on one side, and we who serve on the other side, are both approaching the attitude of recognizing the obligations and responsibilities of each other and the fair and reasonable consideration that each is entitled to in all of the contentions and controversies that arise."

In those sentences from the presidential address of George R. Fuller you have the keynote of the highly successful annual convention of the Up-State New York Telephone Association. Six hundred representatives of the Up-State companies, 250 of them being from the traffic departments, attended the meeting and re-elected the officers and directors headed by George R. Fuller as president.

Secretary and General Manager J. G. Ihmsen gave specific evidence of the association's service, progress and substantial condition. Among the subjects covered in the Ihmsen report were the district meetings, the possibility of increased membership from personal solicitation, consolidations, financing and the possibilities of profitable tie-up with radio.

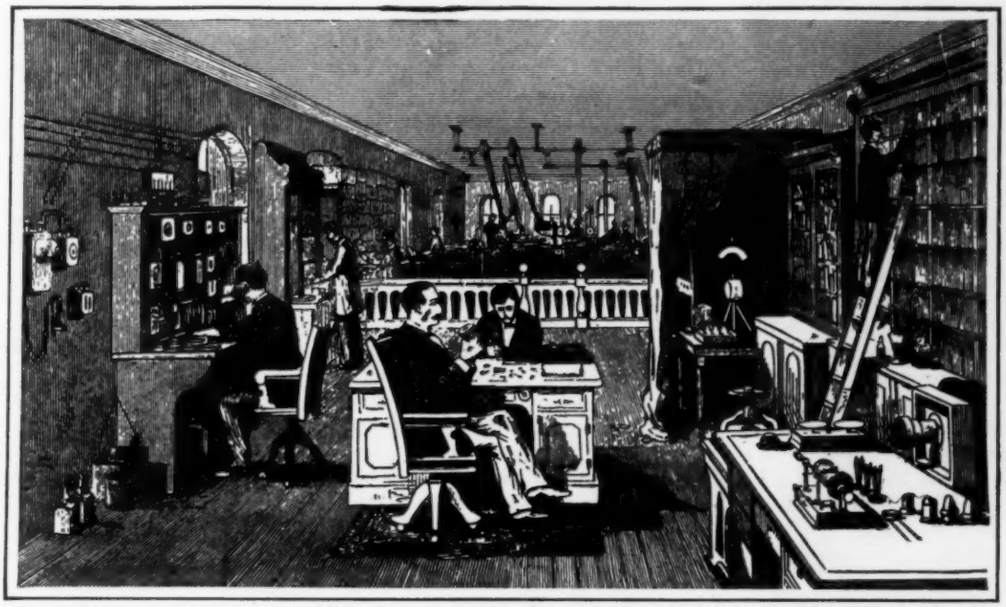
E. J. Wagner, Buffalo, division supervisor of traffic, New York Telephone company, spoke on the problems of traffic management, stressing the importance of completing all long distance calls, and maintaining the high standard of weekday service on holidays. A number of diagrams graphically brought out the many practical features of Mr. Wagner's address.

Necessity of an Independent fund similar to the Bell "4½% fund" was detailed in the remarks made by President MacKinnon of the U. S. Independent association, who told of the vital work that must be done by associations and of the importance of financing such practical contributions to the general Independent industry. Need for raising rural telephone rates was brought out in the address on "Rural Telephone Rates" made by Frank Binkley, Bellefontaine, O., general manager of the United Telephone Co. He showed the Empire state men the figures on his own company's rural exchange income and expenses which have been given previous publication, and advised raising rates, for if a raise were not put into effect in many places the property would be lost anyway.

C. R. Vanniman, chief engineer of the New York Public Service Commission, spoke on "Cooperation Between Regulatory Bodies and Public Utilities," telling of the formal and informal matters considered by the commission and its functions.

Simplification of rate schedules and appreciation of the fact that the commission wants to help telephone service, Mr. Vanniman mentioned as two important needs. Because New York telephone plants having a value of less than $10,000 are specifically eliminated from jurisdiction of the New York commission, there are 1,105 lines in New York not subject to regulation. The commission told of the co-operative methods employed by the commission in trying to solve the problems of these small companies.

Another studious and interesting presentation of regulatory matters was made by C. O. Ruggles, professor of transportation and public utilities, Ohio State University, who spoke on "Commission Regulation of the Telephone Industry." Professor Ruggles treated of the basic factors in equitable rate-making and considered, among other details, the unpopularity of some just rates with the public. The address was another one of the characteristic Ruggles' close-ups of regulation whch have identified the Ohio man



*The Bell Telephone Laboratory in* 1884. *From an old wood engraving published in the "Scientific American"*

# Winning nature's secrets

Every day that passes records some new advance in the telephone art. Constant experiment and observation are winning new secrets of chemistry, of electricity and magnetism, and of matter. Nature's unseen quarry is yielding to the researches of the laboratory that exact scientific knowledge which is among the telephone engineer's most priceless resources. The workshop of the telephone engineer is a scientific laboratory. Here he studies and experiments with principles and laws of our physical environment and sets them to aid us in our daily lives.

Forty-nine years ago the telephone was born in a scientific laboratory—a very small laboratory, to be sure, as it numbered in its personnel none but Bell and his assistant. As the Bell System has grown that laboratory has grown, and as the laboratory has grown the telephone has grown in efficiency, in distance covered, in numbers, in perfection. Countless are the milestones marking progress in the telephone art that have come from the laboratory.

Today the laboratory numbers among its personnel 3000 employees, more than half of whom are skilled scientists and engineers. Headed by a vice-president of the American Telephone and Telegraph Company, it is known as the Bell Telephone Laboratories, Inc., and forms an indispensable department of the Bell System.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES

**BELL SYSTEM**

***One Policy, One System, Universal Service***

as one of the nation's authorities on the subject.

A spirited discussion on rural rates featured the open forum which was conducted by John P. Boylan, vice-president and general manager of the Rochester corporation.

Roland B. Woodward, secretary of the Rochester Chamber of Commerce, spoke on "Vested With Public Interest," highlighting an address of absorbing interest with the remark "It's no crime to be big, but if a business becomes so big that it dominates the whole field in which it works and lives, the public has a fear of it and it becomes 'vested with public interest.' It is around this that the theory of regulation has been built."

On regulation, Mr. Woodward added: "The theory of regulation is that the public has a right to protect itself against poor service from a business vested with a public interest. Regulation has nearly always had its birth in abuses imposed upon the public, and it is a short step from regulation to strangulation. The public may go too far. The public utility may be injured and all suffer. The best regulation is self-regulation."

An address replete with practical pointers was that made by George R. Folds, president of the Cook Electric Co., who described "Protecting the substation and central office equipment from static and high tension currents. Mr. Folds told in detail of the proper protective methods for city and rural exchanges and left with his hearers a realization of the great importance of thorough protection. His address was discussed prior to the reading of the paper on the reconciliation of plant accounts by Mrs. Ines B. Shaffer, chief accountant of the Glen Telephone Company. Mrs. Shaffer described her company's methods in an instructive manner. Frederick M. Crapo, inventor of a new wire galvanizing process and research engineer for the Indiana Steel and Wire Co., spoke on "Important Developments in the Process of Galvanizing Iron and Steel Wires," with particular reference to the new process he developed, in which the telephone industry has been greatly interested.

The luncheon meetings proved to be highly successful in drawing and holding a big attendance. Exhibitors expressed satisfaction with the direct results of their showings; two of them, Stromberg-Carlson and Kellogg figuring prominently in the entertainment of the conventioneers. Stromberg-Carlson staged a plant inspection and luncheon at the plant which was attended by the largest party ever gracing this popular annual feature of up-state meetings. Kellogg entertained the operators at luncheon and vaudeville.

Pioneers held forth at the home town of their president, George R. Fuller, J. K. Johnston, secretary of the veteran's organization, speaking during the meeting, said the Pioneers now had approximately 800 members. Each member is to be given a $1,000 insurance policy, and one of the benefits the association has arranged.

Glowing tribute was paid to the memory of Lillian A. Vavasour, the association's late chief operator who figured so prominently in traffic education.

### *New York Gets Additional Two-Number Service*

New York—Officials of the New York Telephone Company stated that a new service, called a "two number service," is already in effect between New York and Philadelphia, and on or before July 1 will be in use between New York and Norwalk, Bridgeport and New Haven, Conn., and Trenton, N. J.

The two number system has been in operation between New York and Philadelphia for several years, and is remarkably fast. In using it, the New Yorker simply gives the desired telephone number in Philadelphia to the first operator who answers and then holds the receiver to his ear until the connection is established or report given to him by the operator. This method is not used in handling calls for a particular person, such calls being known as person-to-person.

There has recently been established in connection with the New York-Chicago Long Distance service, an operating method and additional circuit facilities which permit of giving a very fast service. Over a period of three months, the service records show that 76% of the calls from New York to Chicago are connected, or a report given that the called party is not available to talk, in five minutes or less and only 3% took more than ten minutes. Plans are being perfected for the introduction of a similar service from New York to various other far distant points, such as Detroit, Cleveland and St. Louis.

### *Permalloy to Increase Service of Canada-Fiji Cable*

New York, N. Y.—The Pacific Cable Board has closed contracts for the manufacture of a new submarine cable to be laid in the Pacific Ocean from Victoria, Canada, to Suva, capital of the Fiji Islands. The southern section of this cable, running from Fanning Island to Suva, will be manufactured by Siemens Brothers & Co., Ltd., of London, and inductively loaded with permalloy, the newly discovered magnetic alloy.

Permalloy, the most highly magnetic substance known, is an alloy of nickel and iron developed by the Western Electric company and first employed in the New York-Azores cable laid last year. Through its use the speed of sending is increased five times over the highest speed previously attained in the use of submarine cables. Existing apparatus was altogether inadequate for receiving messages at such speed, and Western Electric engineers designed an entirely new type of terminal equipment. With this six automatic printing machines are simultaneously used at each end of the line to record the messages as they come over the cable. The new permalloy cable is transmitting 1600 words a minute as against 200 words possible in old style cables.

Permalloy is applied to the copper conductor of the cable in the form of a slender ribbon which surrounds the conductor with a magnetic field. The effect of this is to prevent distortion and attenuation of the signals.

## John's Job Is His Hobby

John Taggart, who spreads the Stromberg-Carlson gospel at all points within convenient cruising range from his home town of Indianapolis, has one hobby that he rides with diligence that pales the record of the old Pony Express horsemen. That hobby is his job. Once in a while Taggart will take an afternoon off to

park in the grandstand of some baseball plant, or foregather with some brother Elks, but those occasions are rare enough to make the first page.

Now there's plenty of excuse of a fellow being passionately in love with work, even some excuse for toiling to the extent that it might be considered a mania. But even though John is admitted to be one of the hardest working boys on the beat, the work he's doing is a snap compared with what he became accustomed to after leaving his native hamlet of Circleville, Ohio. The Buckeye boy's first job was shoveling coal in a gas house, after that anything he might do was soft picking from the viewpoint of toil.

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# TWISTED PAIR OUTSIDE DISTRIBUTING WIRE

**High grade materials**
**Years of experience and research**
**First class equipment and workmanship**
**Perfect control in manufacture**
**Reliable inspection**
**Standard specifications**
**Maker's guarantee**

are required to produce Genuine Copperweld Twisted Pair—which gives its users perfect telephonic transmission, long life, and freedom from maintenance.

**STANDARD SPECIFICATIONS** for Copperweld Twisted Pair are the result of many years' experience in the manufacture of telephone wire and were drawn up by telephone engineers of wide experience.

**THE CONDUCTOR** is No. 17 tinned Copperweld wire, made by the Molten Welding Process.

**THE INSULATING** is done by the Electric Cable Company, the largest producers of telephone wire in the country.

**THE QUALITY** is guaranteed by both the Copperweld Steel Company and the Electric Cable Company.

Copperweld Twisted Pair is manufactured, inspected, sold and guaranteed in accordance with Standard Specifications.

**THIS HIGH QUALITY DROP WIRE IS DISTRIBUTED FROM STOCK BY**

**MONARCH TELEPHONE MFG. CO.**
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**KELLOGG SWITCHBOARD & SUPPLY CO.**
1066 West Adams St.,
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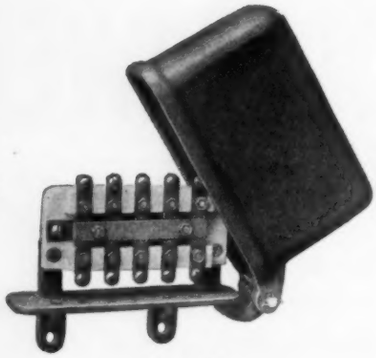
San Francisco Portland

**Copperweld Steel Company**
FORMERLY NAMED COPPER CLAD STEEL COMPANY
MAIN OFFICE & MILLS - BRADDOCK P.O., RANKIN, PA.
30 CHURCH ST., NEW YORK 129 S. JEFFERSON ST., CHICAGO
403 RIALTO BLDG., SAN FRANCISCO

*There is no other nor has there been any "copper-covered steel" or "copper-clad steel" made like "COPPERWELD" by the Molten Welding Process. Have you received full information on Copperweld wire?*

**DO NOT ACCEPT SUBSTITUTES—TAGS ON THE GENUINE CARRY THIS TRADE-MARK "COPPERWELD"**

Protects Cable



Protects Service

No. 202

The use of No. 202 CROSS ARM LIGHTNING ARRESTERS has become the standard practice of hundreds of operating companies.

Plant men find that No. 202 drains static from open wire leads and prevents damage to cable and station equipment.

Self-Cleaning Sawtooth construction of No. 202 keeps the lines clean and in continuous service.

Reliable Electric Company

3145 Carroll Avenue Chicago, Ill.

## Pennsy Shows Progress

### State Meeting Reveals Service to Members—Open Forum a Feature.

Harrisburg, Pa.—Definite evidence of value of state association service to member companies was present in abundance in the record of the 1924 activities of the Pennsylvania State Telephone and Traffic Association. President Bradley, who was returned to office, surveyed the 1924 work of the association in a very interesting address. Among the high lights of the Bradley address was the reference to the strengthening of companies due to changes in the competitive status.

President Bradley said, in part:

During 1924, the following companies purchased, or entered into agreements to purchase, the property of the Bell Telephone Co. of Pennsylvania in their respective territories: Kittanning Telephone Co., Carbon Telephone Co., Bethel & Mt. Aetna Telephone & Telegraph Co., Columbia Telephone Co., Conestoga Telephone & Telegraph Co., York Telephone & Telegraph Co., Morrison's Cove Telephone Co., Forest Telephone & Telegraph Co., Petroleum Telephone Co., Meadville Telephone Co., Peoples' Telephone Co. of Butler, Commercial Union Telephone Co. and Mutual Telephone Co. of Erie.

"A division of the territory formerly operated by the Consolidated Telephone Co. was arranged between the Lehigh Telephone Co. and the Bell Telephone Co. of Pennsylvania, and before the close of 1925 no doubt many more changes will be effected.

"All of these changes have brought additional work to your association's offices."

He added:

"During the week following our 1924 convention the work of finishing up and rounding out the Toll Reference and Text Book was completed in our office. This work was done by Miss Anne Barnes of Iowa, the late Miss Lillian Vavasour of New York and Miss Marguerite Norris of Indiana. This book is now looked upon as the last word in operating practices.

"On July 15, 1924, the Toll Reference and Text Book, containing instructions for the handling of long distance messages, was approved and published by the United States Independent Telephone Association. This book is complete in every detail and the method of passing calls is founded upon a set of standard toll tickets. These tickets have been adopted as standard by your association, and in order to make it possible for all of our companies to purchase them at a reasonable figure, we have contracted for a supply estimated as sufficient to meet the needs of our companies for one year.

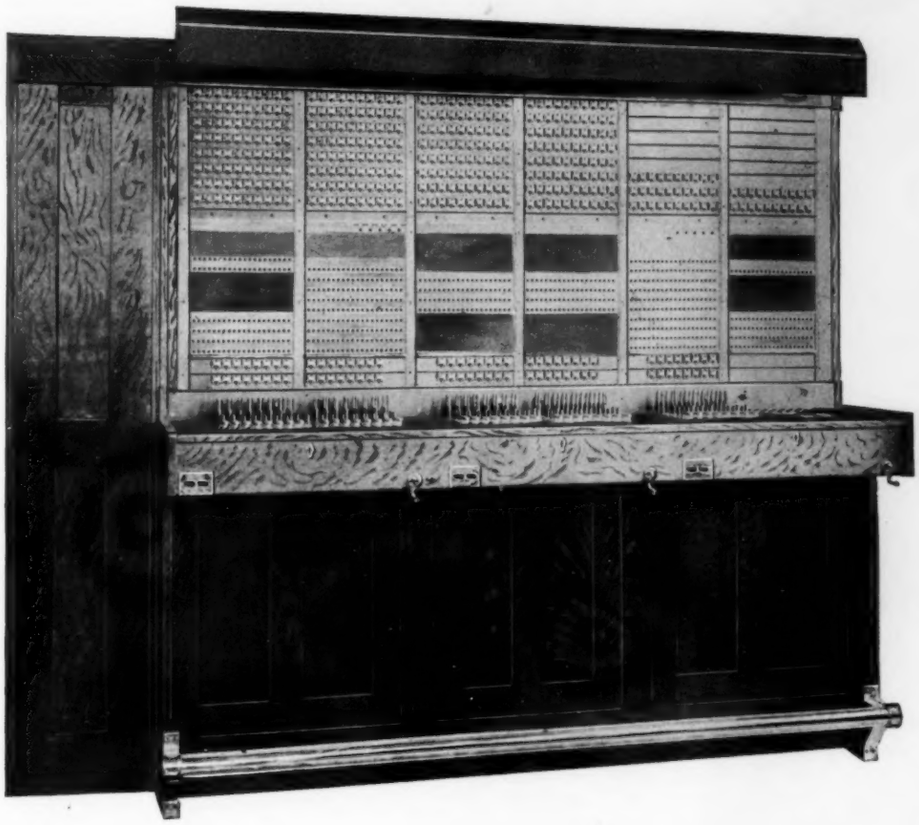
"Pennsylvania has more than twice as many Class A companies as any other state," said President Bradley. "At the present time there are seven and there are at least three more that will soon graduate from Class B into Class A."

Ray H. Manson, Stromberg-Carlson's chief engineer, talked on "Radio from the Broadcast Listeners' Standpoint." The remarks of this expert were followed by open forums on "Financing," led by J. H. Wright; "Getting the Business," led by I. D. Gindhart, and "Holding the Business," led by J. Z. Miller. Other open forums and their leaders were: "Our Rural Connections," C. A. Carl; "Our Rural Exchanges," W. W. Wilson; "Building Up to Property," C. L. Baer; "Getting in the Money," E. D. Schade; "Keeping Up the Plant," S. H. Mounce; "Satisfying the Subscriber," K. B. Schotte.

President F. B. MacKinnon of the national association spoke on association work, and a practical talk on "The Corporation Laws of Pennsylvania" was made by former Lieutenant-Governor Edward E. Beidleman.

A well attended operators' conference, under the supervision of Mrs. Mabel Pearson Sellvin, was conducted during the convention.

# LEICH MAGNETO MULTIPLE SWITCHBOARD



## Design Features:

Line signals are visible to all operators.
Answering jacks and multiple jacks are in reach of all operators.
Answering in any corresponding jack restores the signal.
A busy line puts busy test on all multiple jacks.
Cord circuits supervised by lamps.

## Operating Features:

Any idle operator picks up the incoming call.
The answering operator completes the call unassisted.
The signal is restored instantly so other operators do not attempt to answer the call.
The operator is warned by busy signal not to plug in the multiple jack of a busy line.

## Results:

The same number of calls can be answered on a Leich Magneto Multiple Switchboard with three operators that six operators can answer on a plug restoring transfer board.

The phenomenal operating speed of the Leich Magneto Multiple makes installations practical that otherwise could not be handled economically with a magneto plant.

Good telephone service is assured and because of lower plant and switchboard cost the overhead charges are held within a limit that makes the exchange pay regular dividends without going thru a rate increase.

**Write for details of the Magneto Multiple Switchboard.**

# LEICH ELECTRIC CO.

## Telephones, Switchboards, Accessories

## GENOA, ILLINOIS

**DISTRIBUTORS**

**ELECTRIC APPLIANCE COMPANY**
**Chicago, Dallas, San Francisco, New Orleans**

**ST. PAUL ELECTRIC CO.**
**St. Paul, Minn.**

**POST GLOVER ELECTRIC CO.**
**Cincinnati, Ohio**

**B-R ELECTRIC COMPANY**
**Kansas City, Mo.**

# Fort Wayne on Automatic

## Cut-Over Is Staged With Impressive Ceremony

*Anthony Office, Containing Business Offices and Quarters of Home Tel. & Tel. Co. and Toll Exchange of Indiana Bell Tel. Co.*

Ft. Wayne, Ind.—At about 12:10 o'clock, May 30, the old manual telephone equipment that has been serving Fort Wayne telephone users for many years ceased to function, and the new automatic apparatus, completely installed, tested and ready, began to carry the city's telephone traffic.

It was a dramatic moment for those who witnessed the old order yield its place to the new when Charles M. Niezer, president of the Home Telephone and Telegraph company, threw a huge switch and the splendid equipment which had been lifeless began to vibrate and hum with electric life.

A large crowd of prominent citizens were present to witness the change and officers and operating officials of the company were showered with congratulations upon being among the first of the large telephone companies of the country to adopt the progressive new system.

About two hundred telephone operators quit the employ of the company at the moment the cutover was completed. Several of them will be married soon, it was announced, and most of the others have already secured other positions.

It was announced last night that the Indiana Bell Telephone company will handle all long-distance calls for the Home company. The long-distance exchange will occupy practically the entire third floor of the building and will employ about seventy operators. The long-distance calls will be handled by the manual system.

Frank E. Bohn, general manager of the company, gave the instructions for the cutover by telephone from the new building.

The first call to be carried over the new system was made by Mr. Bohn, who dialed the number of the home of Mayor William J. Hosey. When the mayor answered, Mr. Bohn said:

"Mr. Mayor, this is Frank Bohn of the telephone company speaking. I have the pleasure of announcing to you that the automatic telephone system for Fort Wayne is an accomplished fact and that this call I am now making to you is the first to be carried over the new system."

The mayor replied: "In the name of the people of Fort Wayne, Mr. Bohn, I congratulate you as a representative of the telephone company for having successfully placed this splendid new system in operation. I have no doubt that it will mark one of the most important civic improvements Fort Wayne has ever known."

A little later, Mayor Hosey confirmed this acceptance by issuing the following formal statement:

"Fort Wayne has many things of which it is justly proud, but none, I believe, of greater importance to the prosperity and welfare of its people than its latest acquisition—a complete new telephone system, built with an eye to the city's future development, and embodying equipment which is known the world over as the last word in the art of telephony.

"No city can grow appreciably, no city can long prosper, except its people and its business units are provided with an efficient means of social and business communication. The Home Telephone and Telegraph company has just reason to be proud of the part it has played in meeting these needs.

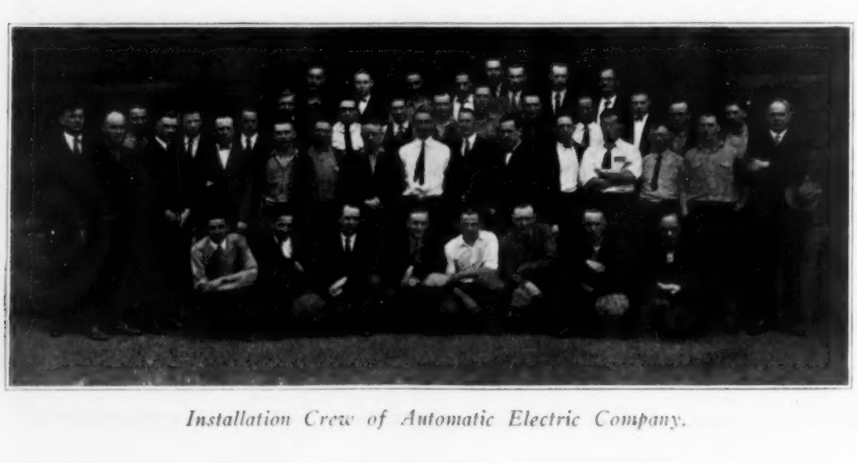
"In accepting the new automatic telephone system for the people of Fort Wayne, I take pleasure in extending my heartiest congratulations to the officials and employes of the telephone company for having planned so wisely and for providing us with what I firmly believe will be of far-reaching influence in making our city bigger, happier and more prosperous."

Nearly twenty-five thousand telephones, served from the two telephone offices, whose new names are Anthony and Harrison, were involved in the cutover, which officials of the telephone company declared to be one of the smoothest and most successful ever accomplished.

Apparently many Fort Wayne telephone users sat up to try out the service, for shortly after midnight, the automatic switches began to click the telephone calls through to completion.

As the morning wore on and the city began its regular activities, the load of traffic began to increase.

The telephone company had set the cutover for Friday midnight so as to take advantage of the comparatively light



*Installation Crew of Automatic Electric Company.*

traffic of Memorial day and the Sunday following for the clearing up of what few minor readjustments might be needed, but although the traffic grew heavier as the morning hours passed, very few of these developed, largely because the entire system is practically new.

The various appointments of the exchange are of the most up-to-date to be had. The business offices on the first floor are spacious and pleasingly arranged so that all necessary business with subscribers may be transacted with maximum comfort and expedition.

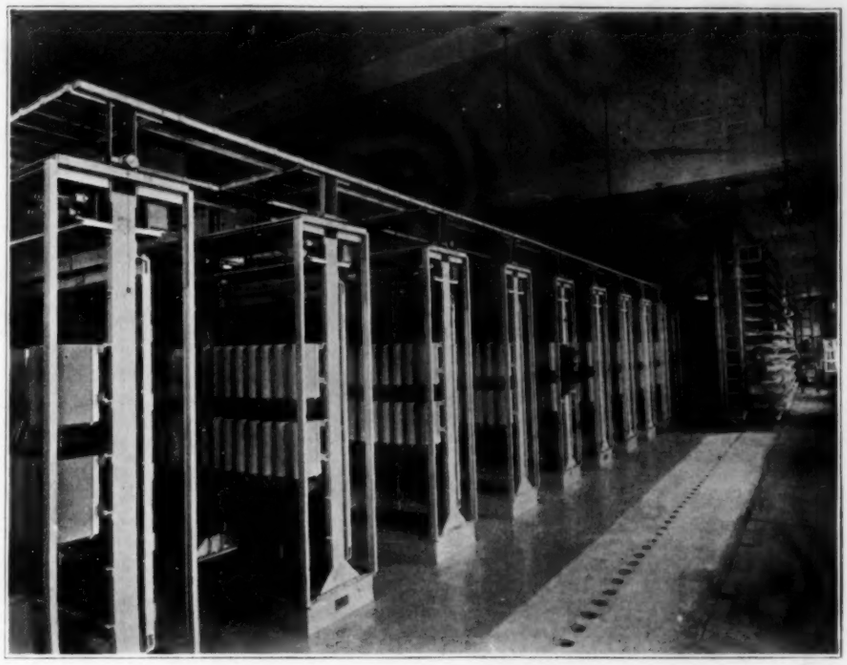
The basement of the building contains the boiler room and the power plant of the telephone exchange, including an immense storage battery and regular and reserve charging generators.

On the top floor of the building besides the long distance switchboard already mentioned are various appointments installed for the comfort and convenience of employes, including a cafeteria and kitchen fitted with the most modern appliances money can buy, dining rooms, restrooms, locker rooms and a spacious assembly hall.

During the installation of the equipment, the various technical employes of the telephone company have been busy studying the new system with the view to maintaining the equipment in perfect order at all times. One of the chief advantages of the automatic system, it is said, is that by the inauguration of carefully devised schedules of routine testing and adjusting, it is the aim to foretstall troubles rather than to correct them after the subscriber has discovered them. To this end, the operating department of Automatic Electric company, of Chicago, which manufactured and installed the automatic equipment, has for some time past been conducting a school for employes of the telephone company, with the result that the company is now thoroughly organized for the maintenance of the service at a very high standard.

The work of installation was carried out in a very efficient manner by Chester M. Sells, assisted by a group of some 43 installers from Automatic Electric Company, in collaboration with the engineering and maintenance staff of the Home Telephone & Telegraph Co.

The cutover was attended by a large number of visitors, including T. C. Thompson, general superintendent; O. V. Dodge, sales manager; F. L. Baer, assistant chief engineer; Roy Owens, sales engineer; H. E. Clapham, advertising manager; H. P. Mahoney, superintendent of installation and operation, and John Wicks, development department, all of Automatic Electric Company; C. M. Niezer, president; Frank E. Bohn, first vice president and general manager; O. Marahrens, secretary; H. E. Gray, general plant superintendent; E. L. Gaines, traffic superintendent, and F. X. Staub, equipment engineer, all of the Home Telephone & Telegraph Co.



*Anthony office switchroom (connectors).*

Other visitors included Hart Farweli and A. L. Staderman of Citizens Telephone Co., Terre Haute, Ind.; Vic. Hensel, Peninsular Tel. Co., Tampa, Fla.; R. K. Judy, St. Marys Tel. Co., St. Marys, Ohio; A. O. Black, People's Tel. Co. of Butler, Butler, Pa.; James A. Rae, Sioux City Tel. Co., Sioux City, Ia., and F. O. Cuppy, Lafayette Tel. Co., Lafayette, Ind.

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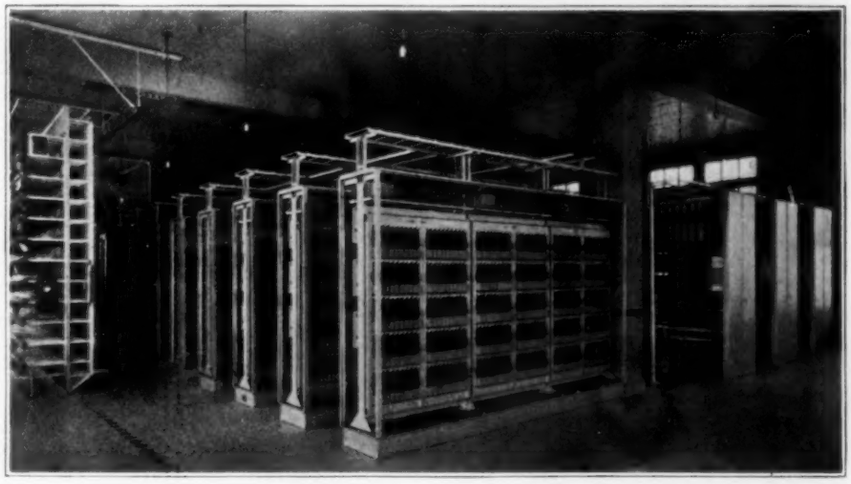
Detroit, Mich.—Michigan Bell Telephone Co. has authorized expenditure of $3,720,000 for extensions, of which $1,500,000 is allotted to the Detroit district.

## *Washington to Meet at Spokan, June 19-20*

Spokane, Wash.—The Washington Independent Telephone Association will hold its annual meeting in Spokane, June 19 and 20. E. F. Keyes of Sunnyside is the president and J. W. Baker, commercial superintendent of the I. U. Company, is the secretary.

Last year the meeting was held in Puyallup. While there attending the convention, Frank Davies and J. W. Baker extended the invitation to the association to be their guests in Spokane at the next meeting.

The members of the Independent Telephone Association will hold their gatherings in the Elizabethan Room at the Davenport Hotel.



*Anthony office switchroom (line switches).*

# BRACH VACUUM ARRESTERS

**at prices within your reach**

When the best protection costs no more, why not have it? BRACH arresters insure; non-grounding of lines, cables, clear transmission, balance of potential between pairs, and full protection against power crosses or lightning. There are no carbons to clean and no maintenance bills.

You can readily afford BRACH Vacuum Arresters at our present low prices. Type 440, shown above, is furnished with porcelain base, fuses and mountings.

**L. S. BRACH MFG. CO.**
NEWARK, N. J.

**RUNZEL-LENZ ELECTRIC MFG. CO.**

Specialists in the manufacture of

# CORDS

for

## TELEPHONES and SWITCHBOARDS

A R-L cord to fit any make of telephone or switchboard

**RUNZEL-LENZ ELECTRIC MANUFACTURING CO.**
1751-57 North Western Ave. CHICAGO

DEPENDABLE SINCE 1904

"INDIANA"

## *Double Galvanized Telephone and Telegraph Wire*

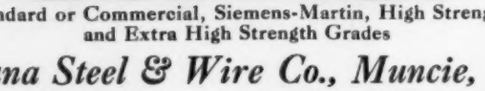
Crapo Patents

*Non-Peeling*
*Non-Cracking*

At last the Telephone and Electrical Industry is assured longer life and lower maintenance on galvanized wire construction through our *new* and *improved* patented Galvanizing Process, which insures a wire with Non-Peeling and Non-Cracking Zinc Coating. Now in full commercial production. Carried in stock by Representative *Supply Jobbers*.

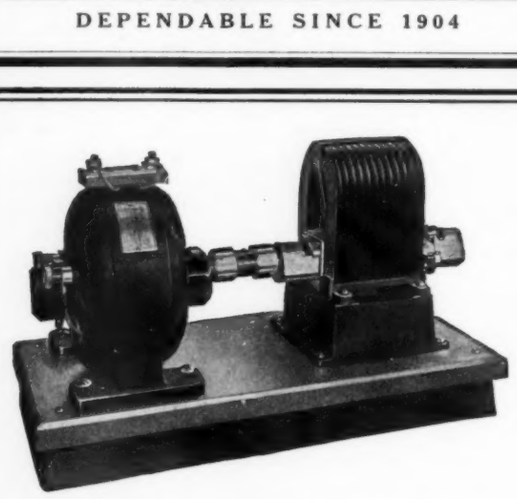
Illustration at right shows what happens to old process galvanizing, while illustration at left shows assured results of Crapo process—(patented)

## *Galvanized Steel Strand*



Standard or Commercial, Siemens-Martin, High Strength and Extra High Strength Grades

***Indiana Steel & Wire Co., Muncie, Ind.***



## THE HOLTZER-CABOT MAGNETO RINGING MOTOR-GENERATOR

Frees you from the necessity of battery testing and contact adjustments;

Saves the money you were wont to spend for battery renewals;

Cuts out the necessity of hand ringing, with its retardation of service, and consequent unpleasant intercourse between your subscribers and your operators;

Insures a uniform ringing current, obviating the necessity for your subscribers to complain that their bells do not ring satisfactorily.

**THE HOLTZER-CABOT ELECTRIC CO.**

Boston Detroit Philadelphia Baltimore
Chicago New York Minneapolis St. Louis

# LINE AND DESK

## REPEATING COILS TO REDUCE NOISE FROM TRANSMISSION LINES

A Dakota subscriber sends the following query:

A ground circuit party line is made very noisy because a branch parallels a high tension transmission line.

By re-routing the lines, I could make a metallic circuit from the switchboard to parallel the high voltage line, and the grounded portion would branch from that.

Would it be practical to do that and to instal a phantom coil at the branch connection?

I understand that if such an arrangement was made I would have to have another jack at the switchboard, that there would be two party lines, one grounded, and the other metallic.

On a separate sheet, I am diagraming the line as it is, and also as it might be routed.

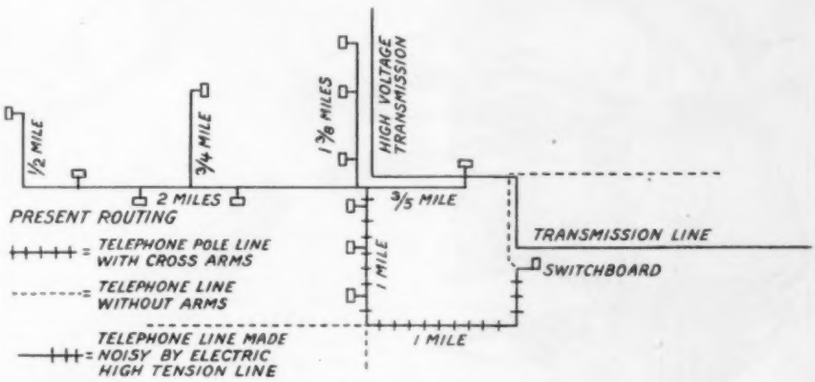
I would like very simple and detailed information as to what would be the cheapest and what would be the best way; or, I may say, the most practical way of remedying the present condition; and if coils of any kind should be used, exactly what kind should they be, where can they be procured; what protective apparatus should be used with them and how should the installation be made.

In reply we can say that the scheme of using phantom repeating coils in the manner suggested is being employed in certain cases and the result is a quiet telephone line. If such a coil were inserted at the point marked X with the windings as shown, that is with the grounded circuit branches connected to one winding and the metallic circuit branches connected to the other winding, the circuit should be quiet if the metallic circuit branches and the power line are balanced properly. No additional jacks would be needed as the circuit would work into the switchboard just as it does now.

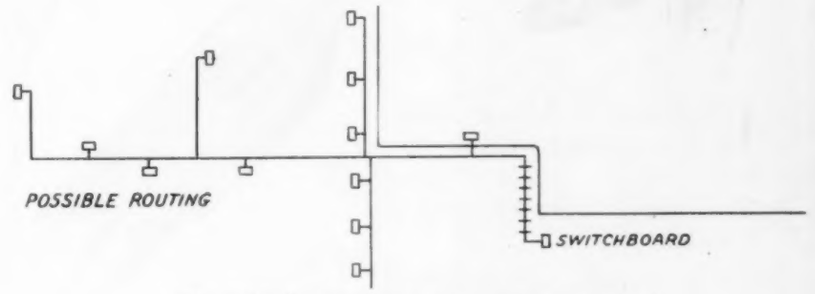
The coil and protectors should be located in a tight wood box to protect them from the weather. Fuse and open space arresters should be used for protection against lightning and possible cross with the high voltage line. The cost of the installation will probably be somewhere in the neighborhood of $15.00. Several manufacturers make satisfactory coils for this purpose and other manufacturers make arresters. We would suggest that you write to the manufacturers of equipment and arresters that are found on the advertising pages of TELEPHONE ENGINEER. In further comment, we may say that the cost of the arrangement as shown will be quite a little less than making the entire line metallic but the maintenance of the coils and arresters is likely to amount to something because there is always likely to be interruptions due to blown fuses and possibly to burning out the coil. In the long run we would recommend the making of the entire line metallic, as soon as it is practicable to do so. In the meantime the coil will give temporary relief. One company we know is now engaged in eliminating a number of such coils by making branch lines metallic.

## HOW A FOREMAN CURED A "YESBUTTER"

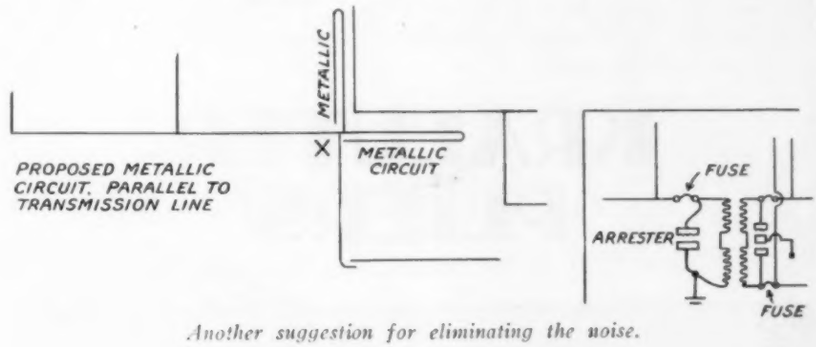
A "yesbutter" is a person who agrees with almost any reasonable proposition you may make, and then adds a "but"




*The noisy line as it now is.*




*The noisy line as owner suggests re-arrangement.*




*Another suggestion for eliminating the noise.*

clause which entirely nullifies the whole thing. He agrees, and then weasels the agreement with a statement that is partly or wholly contradictory. "Yes, it *is* a pleasant day—but it's too hot and muggy." "Yes, that *is* a good automobile—but it doesn't wear well." And so on. A "Yesbutter" is a fence-straddler, who lacks self-confidence and the courage of his convictions, or who perhaps has no convictions. He is to be found in almost every gathering of men. He agrees, readily enough, that a certain practice is dangerous, but inasmuch as nothing has yet happened to him in consequence of it, why should he worry? The only knowledge that you gain from a reply of this kind is the knowledge that the man has no realization of the danger, and that he therefore is not ready to do anything about it, except under compulsion and continual supervision.

The "Yesbutter" is one of the banes of the safety engineer.

One "Yesbutter" of this sort met his match in a foreman who was pointing out the hazard incident to following a certain practice, and who asked the workman if he did not see that there was danger of losing his fingers or his hand. The reply was "Yes—but I am pretty handy with my *left* hand." The foreman accepted the statement with no comment beyond proposing that a test be made during the lunch hour. The workman agreed to this proposal readily enough, because it happened that he could write and throw a ball with his left hand, and do many other things that most of us can do only with our right hands. He found quite a bit of innocent amusement in picturing himself the surprise and discomfiture of the foreman when the time of trial came.

Promptly at noon, however, the foreman appeared bearing a strip of cloth about two yards long. With this he bound the man's right arm to his side, and told him the test required him to do nothing more than to wash the grime from his remaining free hand, eat his lunch, and fill and light his pipe, all without any assistance from any one else—and then to give an honest opinion as to whether or not his ability to use his left hand would compensate him for the loss of his right one. It did not take long for the man to reach a sound conclusion, and his "yesbutting" days were over so far as concerned the one particular practice that had led to the experiment. We hope they were over in every other respect also, but of that we have some doubt, because the "yesbutting" habit is a strong one, and is not easily overcome.

A sane safety program never brings regrets; there is no shelf nor pigeonhole in it, where a "but" can properly be lodged.—*The Travelers' Standard.*


KRAEUTER & CO.

Diagonal Cutting Pliers. No. 2601, 6 in. $1.65

Radio and Switchboard Pliers. No. 1561, 6½ in., $2.00

Kraeuter Lineman's Pliers, No. 2801, 8½ in., $2.75

EVERY pair of Kraeuter Pliers is hardened with extreme accuracy.

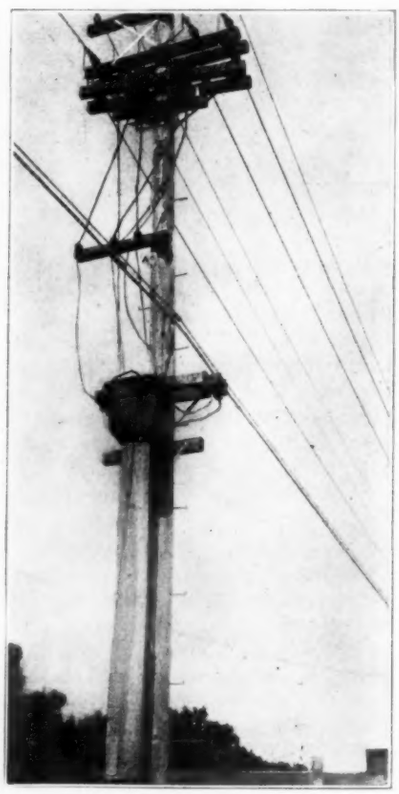
Their cutters are *hard* but not brittle.

Their rugged lap-joints *fit close*, and hold the cutters true.

Every pair is tested at the factory for *strength, toughness* and *cutting power.*

KRAEUTER PLIERS

KRAEUTER & CO., Newark, N. J., Established 1860

*Ingenious arrangement for avoiding vertical electric wire runs.*

### AVOIDING THE VERTICAL ELECTRIC WIRE RUNS.

Ray Blain, telephone engineer, who has been a frequent contributor to this department sends us a photograph of a method of obtaining clearance between cable messenger and a vertical run of electric light wires from the top of the pole to a transformer mounted below the cable. The arm holding the vertical wires is offset so that the wires are all on the side of the pole opposite the cable. Obtaining satisfactory clearance in these cases is often a difficult problem and the method shown may point the way out of some troublesome situations.

### A JOB FOR THE SWITCHMAN?

Subscriber, at Omaha commercial counter: "My telephone is out of order."

Clerk: "What seems to be the trouble?"

Subscriber: "Why, when I dial my own number I get a busy signal."—The North Western Bell.

### ANOTHER POET WHO IS A GOOD POLE MAN BUSTS INTO VERSE

Publication of the deathless lyric, "Our Creosoting Flivver" in the April TELEPHONE ENGINEER, has inspired R. S. Manley, president of the Texas Creosoting Company, to respond to the galloping verse of P. G. Fitzpatrick.

Mr. Manley, operating under Texas Poetic License, 52-465, sends the following metered information out into the waiting world.

**"Creosote It Right to Begin"**

Methods have been found
So the papers say,
To creosote decaying poles
With a creosote spray.

To save the poles weakened
By fungus attack
They take a little flivver
With a pressure tank.

No doubt this will serve
To arrest the waste
But the strength once gone
It cannot replace.

The life will be longer,
But don't expect too much,
It's a temporary shift
And should be viewed as such.

The engineering economic
Method to pursue
Is to purchase at the start
Poles treated through and through.

First take a pine tree
That's straight, strong and sound,
Peel it and season it,
Well off of the ground.

When the pole is seasoned
But not too long,
For over-seasoned poles
Are no longer strong.

Frame it all around,
And creosote it deep,
Shallow penetration
Will not prove cheap.

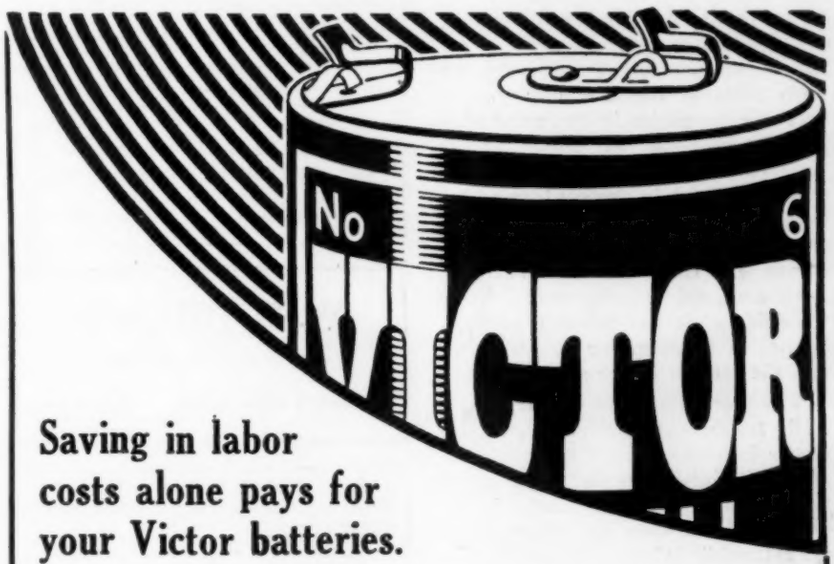
Creosoted Pine
Will defy decay;
"First cost is the last cost"
Purchaser will pay.

Sleet storms do your worst,
Blizzards too, may rage,
Still the pine poles stand,
Strong in spite of age.

Take your pad and pencil,
The yearly bill to find,
Awful storm replacements,
And costs of every kind.

Service interruptions,
New poles replacing old,
Attacks of ants and fungi,
All call for yellow gold.

Modulus of rupture
(Way above the rest)
With elastic limit,
Prove Pine poles best.




**Saving in labor costs alone pays for your Victor batteries.**

If we weren't afraid of the shock paralyzing some of our good prospective customers for Victor batteries we could head our advertisement "Batteries Free." That's about what the Victor proposition analyzes down to.

Take fifty cents as a very low average cost of labor per battery change. Then compare the reduction in changing made possible by Victor's longer life, and you have a saving in labor cost that most Victor users find pays for the batteries.

There are all kinds of exclusive construction features that account for Victor longer life; thickest zinc shell, densest compound, special paste and liners to prevent internal action and fluted carbon electrodes.

The final factory inspection given Victor batteries is the most severe to which dry batteries are subjected.

Better get all the facts from your nearest Victor distributor, and be SHOWN that Victors will save you money.

**CARBON PRODUCTS CO.**
**LANCASTER, OHIO**

### *Oklahoma Districts Meet at Shidler and McAlester*

Oklahoma City, Okla.—H. W. Hubenthal, engineer, Oklahoma Utilities Association, marks as the biggest and perhaps one of the most enthusiastic Oklahoma state meetings, those at Shidler, May 12, for the first district, and at McAlester, May 14. Seventy-three telephone folks and sales representatives attended the Shidler meeting and thirty-seven the McAlester meeting. The Shidler meeting was the largest district meeting so far conducted since these meetings were started four years ago.

Radio however, was the chief topic of both sessions. Speakers on the relation of radio to the telephone industry explained the operation of radio, also that radio could be profitably employed by telephone companies in connection with their business. It was shown that it is practicable for telephone companies to use radio as a by-product both in distribution of radio equipment and by means of a communication service. Instances were cited where this is actually being done, on a paying basis. Voice transmission, it was asserted naturally belongs to the telephone industry since it is the founder of the service.

A comparative review of the history of the telephone, electric, radio and automotive industries showed that while the automobile industry is the biggest of all manufacturing industries, radio is developing faster than any other except the automobile industry. It was brought out that in 1924 as much money was spent for radio in America as for all telephone improvements and extensions; that reliable authorities predict there will be spent close to one billion dollars for radio during the year 1925, or at least three times as much as for telephones. It is estimated that during this year for every dollar invested in telephones $1.25 will go into the electric business, $2.50 will be spent for radio and $4.25 for automobiles. At the end of the year 1925 it is expected that the radio business will represent an investment of nearly two billion dollars which will have accumulated during a short period of four or five years, as compared with a total investment of about four billion dollars in the telephone industry which has had fifty years of development.

Discussions on transmission tests and protection methods disclosed that proper upkeep of plant is essential to good transmission, especially for long distance service; that while toll service is important, local service is of far greater importance to the vast majority of telephone users; and the local exchanges are big boosters of toll service.

A talk on "Protection Through Insurance" showed that while telephone companies usually insure the service rendered to patrons in every conceivable and practical way against interruptions by protecting their plant and equipment, they often neglect their income and permit it to suffer losses through accidents and otherwise, largely due to their failure to protect themselves by means of liability and workman's compensation insurance.

Trouble and inconvenience caused telephone companies by house movers formed the basis for another interesting discussion. It was brought out that state laws and usually city ordinances require house movers to notify the telephone companies and electric companies when wires and cables are to be moved, and that the parties desiring to have this done are required to pay for such work. Also that in case of violation of these laws telephone companies have protection or redress through local courts by injunction or action for damages.

The questionnaires on switching rates and differential desk set rates, sent out recently by the association, were discussed, and many inquiries relating thereto were answered.

Conferences of traffic and commercial employes were interesting and beneficial to those in attendance. Commercial and traffic problems were presented and discussed. The conferences also included five to seven minute addresses by young lady employes of the traffic and commercial departments.

Officers elected for the ensuing year are as follows: First District, M. D. Rogers, Hominy, chairman; Sam Wilson, Barnsdall, secretary; 1926 meeting place, Barnsdall, Okla. Second District, J. W. Holt, Quinton, chairman; Sherman Mooter, Hanna, secretary; 1926 meeting place, Hanna, Okla.

**J. K. Johnston, Telephone Engineer**
During recent years I have been privileged to appraise Telephone Exchanges all over the United States. The list totals 410. Would you like to avail yourself of my services?
903-4 Lemcke Building, INDIANAPOLIS

Valuations—Supervision—Plant—Inductive Interference—Expert Administrative Counsel for Utilities
**JAY G. MITCHELL**
TELEPHONE ENGINEER
Member A. I. E. E.
1042 W. Monroe St. Springfield, Ill

**W. H. CRUMB**
*Telephone Engineer*
9 South Clinton St. Chicago

**COFFEY'S**
**Central Accounting Department**
Keeps the records and makes up all reports for companies (large and small) in 17 states. The cost is about half the salary of a bookkeeper. It will not cost you anything to inquire as to our plan, charges, etc. Write today.
Coffey System & Audit Co., Indianapolis, In
National Convention, Room 110

**J. G. WRAY & CO.**
**Telephone Engineers**
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies.
J. G. Wray, Fellow A. I. E. E.
Cyrus G. Hill
1217 First National Bank Bldg., Chicago

**FOR SALE**
15 miles of new No. 12 Double Braid Weatherproof Iron Wire in ½-mile coils, at 6c per pound.
Queen City Electric Company
1734 Grand Avenue Chicago, Illinois

FOR SALE.
One hundred second-hand Baird & Delta Lock Out Attachments, in good condition. Price twenty-five cents (25c) each, f. o. b. Vernon, B. C., Canada. Address
Okanagan Telo. Co.,
Vernon, B. C., Canada.

## Fire Laddies' System

*c. I. N. R.*

New York firemen now have this new helmet telephone which enables fire fighters in a smoke-filled building to keep in constant touch with their comrades. The cable is carried on a reel with batteries in a holder at the side. The device is said to represent the last word in reliable communicating devices to serve under the rigorous conditions of fire fighting.

## *A Contemporary's Sketch of Oliver Heaviside*

The passing of Oliver Heaviside, a few months ago, called attention again to the important contributions of this eccentric genius to the mathematical and theoretical side of electrical science and to communication in particular. Mr. J. S. Highfield, a past president of the (British) Institution of Electrical Engineers, in a recent number of The Electrical Review tells of his experience in meeting Heaviside in a manner that throws additional light on the character of the man. Mr. Highfield says:

"Oliver Heaviside I knew first in 1921 when I was president of the Institution of Electrical Engineers. The council desired by some special mark to celebrate the 50th year of the institution's foundation. Amongst other things, the Faraday Medal of the Institution of Electrical Engineers was created, and it was awarded first to Oliver Heaviside; it was in fact partly the desire to praise his work that led to its foundation and there could be no worthier motive. It is so easy to forget unforgetable service when performed by one who chooses to live a life quite remote from his fellows, who from the Olympian heights of a most gifted mind, uses an impish pen to write disparagingly of authority and who flouts all the honors which most men desire and some men seek.

It was my duty as president to present the medal, and the duty was an interesting and pathetic one. Heaviside lived entirely alone in a pleasant house in Torquay—a house decaying from long neglect. I called first by appointment and found him waiting in the weed-covered drive in an old dressing gown, armed with a broom and trying rather vainly to sweep up the fallen leaf. He was pleased to see me in a queer shy way, and took me through a furniture laden hall, all covered with dust, to his own room. He had papered the walls with prints and reproductions from many publications, and pointed out to me old presidents of the Institution of Electrical Engineers and all the recent ones, and asked me about them. The walls held a pictorial record of his life's interests. He was in all ways entirely competent, and still preserved his power of impish criticism. Often he was amusing in a caustic way; he was intensely interested in my account of the commemoration ceremonies, and genuinely pleased that he had been recognized at those meetings as one of our famous men. His way of life made a pathetic background to his mental activity, but I am sure he did not regard it as pathetic. He talked freely of all recent work and development, but his talk was interfered with by many petty personal complaints of the most homely description. I saw him several times and tried to improve his menage, and especially his food supply, which was inadequate, but with little result. He was quite content to live as an old world hermit, and so indeed he lived.

I saw him again in the August of 1922, and again when I formally presented the Faraday Medal early in September. He seemed greatly improved in health, and there is no doubt that the interest taken and shown in him by his fellow workers of the institution had really cheered him; in fact, he seemed quite happy. The presentation of the medal was interesting. He vigorously criticized the wasteful expense of the leather-covered vellum document which accompanies the medal, but was consoled by the medal being of bronze and not of gold. He read every word on both document and medal, and was especially pleased to see the name of Alexander Siemens, who signed as the oldest past president. He talked much about telephony and wireless, all interspersed with homely grumbles at the many defects of his neighbors. He seemed to know all that went on in the town.

## *Treated Pole Purchases Set Record in 1923*

Washington, D. C.—The Bureau of Census has just released figures showing the number of cross-ties and poles purchased and preserved in the year 1923. Practically all of the large users supplied information as to their purchases but no attempt was made to secure data from the small rural telephone companies. The number of poles purchased was smaller than for any other year for which statistics are available, the greatest proportional decrease being shown by steam railroads. Cedar, including northern white, western red, southern red and juniper, continued to be the principal timber used for poles. An increase in the number of chestnut poles used has doubtless been due to the condition created by the chestnut blight, as a result of which it has become necessary to cut considerable quantities of the timber to save it. When the purchases for 1923 are compared to those for 1915 it will be noted that increases appear for poles 30 feet or more in length, together with decreases for poles less than 30 feet in length. This indicated decrease is due largely, if not wholly, to the fact that the small rural telephone companies did not report their purchases for 1923.

The number of poles treated in 1923, 1,527,665 was the largest on record and exceeded by 561,265 the number reported for 1922.

## *Year's Increase in United Kingdom Ten Per Cent*

London, England.—During the year ending March 31st, 1924, the number of telephone stations in the United Kingdom rose to 1,158,492, an increase of 107,820, or 10.3 per cent. The stations in the London area numbered 410,861, and those in the provinces 747,631, of which 51,489, or about 7 per cent, are in the Liverpool district. The private residence telephones increased to 186,684, a net growth of 32,056, or 21 per cent. The residence rate subscribers represent 16 per cent of the total telephones. The total number of telephone stations working at the end of December, 1924, was 1,243,621, an increase of 85,129, or 7.3 per cent for nine months, or at the rate of 9.7 per cent per annum. At the end of December the private residence telephones had risen to 212,314, or at the rate of 18 per cent per annum.

### London to Have Cable Tunnel

London, Eng.—On account of the difficulty which has been experienced in finding room to lay telephone and telegraph cables under the main streets of London, it has recently been necessary to dig below the water bearing strata into the London clay, says the Electrical Review. As the services increase, the problem will naturally become more complicated, and it has therefore been decided to construct a steel-lined tunnel 6½ ft. in diameter from the top of Wood Street to Finsbury to accommodate the important cables. Work has commenced, and as the need grows it will be continued until every part of the congested city area is dealt with in a similar way.

NUMBER OF POLES PURCHASED, BY CLASSES OF CONSUMERS AND BY KINDS OF WOOD: 1923

| Kind of Wood | Total | Electric railroads and light and power companies | Telephone and telegraph companies | Steam railroads |
|---|---|---|---|---|
| Cedar | 1,704,247 | 936,008 | 652,166 | 116,073 |
| Chestnut | 808,509 | 342,971 | 392,232 | 73,306 |
| Pine | 402,393 | 157,281 | 198,651 | 46,461 |
| Cypress | 73,403 | 29,614 | 33,686 | 10,103 |
| Douglas fir | 38,052 | 6,424 | 396 | 31,232 |
| Redwood | 13,770 | 131 | 13,483 | 156 |
| Oak | 8,750 | 2,151 | 1,429 | 5,170 |
| Spruce | 1,841 | 1,126 | 72 | 643 |
| Locust | 1,797 | 1,186 | 606 | 5 |
| Gum | 1,510 | ..... | ..... | 1,510 |
| All other | 6,522 | 5,499 | 871 | 152 |
| Total | 3,060,794 | 1,482,391 | 1,293,592 | 284,811 |

### *A Telephone Chronology*

June, this year, sees the 50th anniversary of the first transmission of words by telephone, according to the chronology that accompanies the annual Bell report. That occurred in 1875. In 1876 the first conversation over an overhead line two miles in length was held, Boston to Cambridge.

In 1880 there were 30,872 Bell telephone stations in the United States, and conversations had strung out to 45 miles, from Boston to Providence.

Conversation by underground cable, the first one only a quarter of a mile long, dates from 1881.

Boston was talking to New York for the first time in 1884, and New York to Chicago in 1892.

By 1910 there were over 5,000,000 Bell telephone stations in use.

In 1915 we got a thrill out of taking from Boston to San Francisco. In that year, too, speech was transmitted by radio and telephone from Arlington, Va., across the continent to San Francisco, over the Pacific to Hawaii, and across the Atlantic to Paris.

By 1921 we had the loud speakers, to carry President Harding's voice, at his inauguration, to 100,000 people.

Trans-oceanic radio telephony came in 1923 with New Yorkers talking to a gathering of scientists and journalists in New Southgate, Eng.

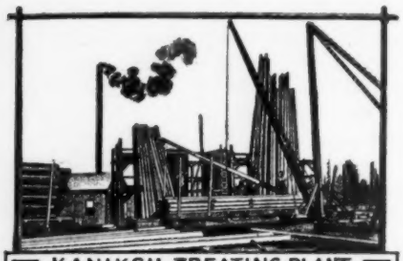
The transmission of pictures by telephone circuit came in 1924, and this year was demonstrated with the transmission of photographs of the inauguration to New York, Chicago and San Francisco in seven minutes.

### *Interstate Utilities Company Has Model Annual Report*

Spokane, Wash.—An annual report that might well be used as a model for many teelphone companies in submitting details of the company operations and plans to security holders is that of the Interstate Utilities Co. for 1924. The report is a readily understandable summary of the financial condition and the construction and operation work and plans, compiled in a sixteen page booklet, well printed on good paper.

### ADDRESS WANTED

Wanted—Present address of R. Rawlings, a line foreman for the Illinois Bell Telephone Co., so we may forward his copy of "Telephone Engineer." Address: "Telephone Engineer," 28 E. Jackson Blvd., Chicago.

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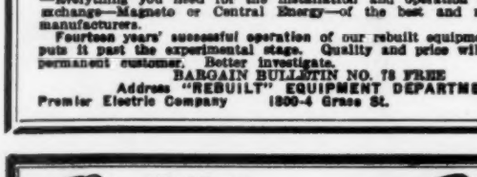

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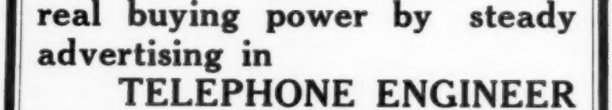
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# Cleveland Bell Building

## 20 Stories High, Cost $4,000,000, Houses 2,000 Employes—Far Future's Needs Are Anticipated

**Chief Features of Cleveland's New Bell Telephone Building**

*Perpendicular Gothic architecture.*
*"Set back" construction.*
*Costs four million dollars.*
*20 stories; 324 feet high.*
*Solidly built structure.*
*Three basements; 50 feet below curb.*
*Thoroughly fireproof.*
*Houses 2,000 employes.*
*Provides for Cleveland's future.*

Cleveland, O.—To care for the telephone service of downtown Cleveland and to permit of the abandonment of the present Main exchange property at Champlain and Third streets, in connection with the construction of the new Union Depot in Cleveland, Ohio, a new telephone building—one of the most beautiful business sthructures in Ohio—will be erected on Huron road on the site of the old Empire Theater and the Huron Road Hospital by The Ohio Bell Telephone Co. The total cost of the new building alone will be upwards of $4,000,000. Wrecking of the present structures will be started at once.

The perpendicular Gothic style of architecture will be employed, following the "set back" theory much used in New York and other large cities.

The structure, which will have 20 stories, will be 324 feet high and will be the tallest office building yet constructed in Cleveland. Its height will be greater than for an ordinary office building of the same number of stories because nine floors will have high ceilings to accommodate telephone equipment. It will occupy the full width of the lot, 154 feet six inches, and will be 145 feet deep. Excavation must be made fifty feet below the curb line so the foundation may rest on solid clay. Only a library or newspaper building, with its heavy presses, compares with the type of building construction required for a telephone building. This foundation depth will provide three basements, two being for heating and power plants, machinery, shops and storage, while a third will allow for a general restaurant and the cable vault, where myriad lines will enter the building on their way to the switching rooms.

On the first floor will be the business offices, with space for several store rooms. The next six floors will house telephone equipment. The eighth to the thirteenth floors will take care of the long distance boards, information and special boards, terminal and telegraph equipment, together with operators' quarters, rest rooms, kitchens and lunch rooms. The fourteenth to nineteenth floors will be used for general offices, while executive offices will occupy the twentieth floor.

The first set back will be at the eighth floor and for a distance of approximately 20 feet on each side of the building. The second set back will be at the sixteenth floor and of approximately the same amount on all four sides of the structure.

The building will have a floor space of 308,000 square feet exclusive of basements, and will house central office equipment replacing the Main and Cherry central offices and the Superior central office. It also will house the general offices of the Ohio Bell Telephone Co. and of the American Telephone and Telegraph Co. now at 4300 Euclid avenue, also the general commercial offices now in the Anisfield building, the plant division offices at 6205 Carnegie avenue and the traffic division and district offices now at 4300 Euclid avenue as well as the directory, operators' training school, commercial training school and northern division commercial engineer's office now in the Electric building. This will give the building a population of more than 2,000 people.

The new building will, of course, be of fireproof construction throughout. The frame work will be of structural steel thoroughly fireproofed, floors will be of reinforced concrete, windows will be of heavy gauge metal, sash will be glazed with wire glass and wherever fire hazards warrant, full automatic rolling steel shutters will be provided for window openings. The doors will be of approved metal construction while the stairs will be of metal with non-slip treads.

Elevators of the latest and approved design are provided and will be equipped with the most modern safety devices. They will have a speed of 600 feet a minute.

President C. P. Cooper calls attention to the fact that many special problems are involved in the construction of telephone buildings. They must stand up under the enormous amount of iron, steel, copper and lead which is used in telephone switching apparatus and other central office equipment, and so must be more solidly built. In an ordinary building, the floor load is 70 pounds to the square foot while in telephone buildings provision must be made for from 150 to 200 pounds. The height of the building is made necessary because many of the stories used in housing the equipment must be higher than in an ordinary building. In the average office building, the distance from floor to ceiling is 9½ to 10 feet, while on some of the floors in the Bell building the distance will be 19 feet. Many of the column sections in the new building will weigh more than 20 tons.

"In planning this building," says Mr. Cooper, "The Ohio Bell Telephone Co. has considered the growth of Cleveland far into the future. The quality of service and its protection 24 hours of every day have been given every consideration."

## He Teaches 'Em to Like Leich

For thirteen years A. J. Kohn has been sales manager of the Leich Electric Company handling capably the job of keeping the plant at Genoa humming steadily with business. Kohn is fond of the scenery around those parts, having

been born not so far away from Genoa, at Reeseville, Wis.

After completing the electrical engineering course at the University of Wisconsin in 1906, he got a job on the bench the same year with Stromberg-Carlson. Later he was taken into the engineering department and was successively transferred to have charge of the experimental laboratory, circuit design work, and then to the sales engineering department.

Like all telephone manufacturing and supply company sales executives Kohn sees considerable of America first in the search for business and manages to rake in a goodly amount.

When he gets back to the old homestead there's plenty to keep him busy also, with the Rantoul (Ill.) Telephone Company calling for his attention as its president, and with the usual allurements of lodges, country and business clubs to make life lively in Genoa.

**RECONSTRUCTED EQUIPMENT**

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| Western Elec. Co., No. 305 type 2-bar 4-party line Res. or Hotel sets with 2500 ohm Biased ringers @ | $ 6.75 |
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| Western Elec. Co., No. 301 E Type 2 or 3 bar 1000 or 2500 ohm Common battery type magneto wall set (straight line, Bdg. or 4-party with biased ringer) @ | 6.00 |
| Swedish Am. (Hercules) Compacts 4-bar 1000 or 1600 ohm Bdg., $6.75—5-bar @ | 7.25 |
| American Elec. No. 36 type compacts 3-bar 1000 or 1600 ohm Bdg. @ $6.50—4-bar @ $7.00—5-bar @ | 7.75 |
| Monarch 3-bar 1000, 1600 or 2500 ohm 4-party compacts, $7.00—4-bar @ $7.50—5-bar @ | 9.00 |
| Leich Elec. Co., desk sets with Western Elec. 3-bar 1000, 1600 or 2500 ohm signal set @ $9.00—4-bar @ $10.50—5-bar @ | 11.00 |
| Kellogg Local or Common battery transmitters complete with back and new mouthpieces @ | 1.10 |
| Dean or Garford Receivers with new shells and cord @ | 1.10 |
| Western Elec. Co., 2 or 3 bar No. 22 type Bdg. Generators complete with mounting screws, crank, etc., @ | 1.50 |
| New Western Elec. Co., No. 143 Receiver shells with caps @ 37c, lots of 50 @ 36½c—lots of 100 @ | .35 |
| Western Elec. New Mouthpieces @ 7c —lots of 50 @ 6½c—lots of 100 @ | .6¼ |

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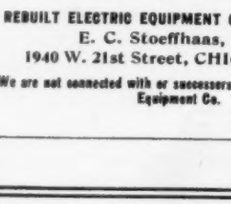

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## Our Literary Digest

**Review of Recent Publications on Telephony and Allied Subjects**

**History of the Telephone in the United Kingdom. By F. G. C. Baldwin. Published in England by Chapman and Hall. D. Van Nostrand Co., American Agents. Price, $15.**

To F. G. C. Baldwin, the world telephone industry owes its gratitude for a substantial contribution to the literature of the profession in his "The History of the Telephone in the United Kingdom." This volume of almost 700 pages is more than a simple record of the progress of the telephone in the Empire. It handles, in a most interesting and illuminating fashion the details of technical development with a wealth of well chosen detail. In this respect it is a notable achievement in combining the abilities of scientist and journalist.

The policy the author follows in this well written history is laid down in his preface: "A knowledge of history is valuable, largely because of the use to which it may be put in shaping prospective policy, in determining future methods and practice and in the avoidance of mistakes made in the past."

From the invention of the telephone and its introduction into England in 1878, Mr. Baldwin traces the technical and managerial development through the discouraging nursery days when the going was rough, through the significant eras to the present day when the British telephone industry stands on the threshold of a vigorous commercial campaign.

The book reveals an astonishing amount of research, much of its material appearing in general record form for the first time.

Notwithstanding the fact that its title indicates a limitation of interest to readers particularly concerned with the growth of the telephone in the United Kingdom, the volume undoubtedly will have a comparatively big sale and meet with warm approval in the United States.

### *Illinois June District Meet, DeKalb, June 17*

De Kalb, Ill.—June meeting of the Illinois Telephone Association will be held here June 17. "Public Utility Publicity Methods" and "Operating Results of Existing Telephone Rates in Illinois" will be featured on the program.

Thrall, Tex.—Mrs. Mary C. Williams of Austin has bought the Thrall telephone exchange from F. F. Smith.


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| Western Electric Co. 1020-AL common battery desk sets with steel bell boxes | $10.00 |
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# Common Battery Farm Lines

## A Telephone Manager Tells What He Has Learned About the Common Battery System in Rural Lines—He Favors the System, But Advocates Caution in Changing*

By SAM TOMLINSON*

I am aware that only a small per centage of managers are interested in this subject; consequently, I shall not take up a great deal of time.

Perhaps it would be both interesting and instructive to relate some of our early experiences along this line. We purchased the Plymouth (Ind.) exchange in 1907, taking possession of the construction work on July 1. The development was limited to a very few farmers; cables were full, there were many split pairs, grounded lines, no soldered joints, cable not in first-class condition, switchboard full to capacity. After making this survey, we decided to give immediate attention to the farmers who were demanding service. We purchased a P. B. X. common battery board, with transfer to magneto. We soon had some farm lines working, and then our troubles began. None of our force had had any common battery experience, and after a short time our troubleman said that they would never work on rural lines. Then I got busy, looking for reasons. I found high joints in the old iron, tree grounds, arresters in use were not good, we had cross talk from grounded lines and split pairs, no transpositions even in c. b. lines. As you may imagine, we did not find all of these troubles at one time, but rather tried one thing at a time.

Right here I want to explain that one reason why we rushed into c. b. was that we had to buy a lot of new telephones to take care of the demands for service, and we wanted to avoid the necessity of discarding new instruments when we changed later.

Well, here is how it worked out. Of course, we had a lot of old, antiquated instruments and, after our first wild dash into c. b., we began to eliminate split pairs in cable by use of c. b. harmonic ringing party lines. We would restore the pair to normal condition, replace the two magneto instruments with c. b. harmonic ringers, thus arranging a party line with room for two new parties. This also vacated two drops on the magneto board. We used the best of the magneto instruments, as we removed them, to replace antiquated instruments on other lines. In installing c. b. lines, we tested cables, soldered joints, and installed proper arresters on rural lines. (We did not use protectors in town unless it was at an insolated station.)

Under this method, our service began to improve and, as our common battery service was so satisfactory, demands for service came. We continued to put two or more lines together, leaving vacant pairs for still other lines. Soon we were able to discard one section of the magneto board, notwithstanding the fact that we had increased the number of stations. Originally, we had four magneto sections of 100 lines each and this process of elimination continued until we had three times as many stations as originally, and still operated on four sections of c. b. transfer system.

This process of substitution occupied about ten years. In the process, we were able to get very fair life out of all material and made our entire change of service at a very reasonable figure. In 1918, we installed a feature switchboard and eliminated the last few lines of magneto.

To get down to the real subject, the advantages of c. b. rural service is decided by the single question: "Is it really better for the subscriber?" To this I would say Yes, from every standpoint.

First, in the efficiency of talking. While no system is superior to local battery when at its best, yet it often happens that when you most need a good battery, is the very time that your local battery 'phone fails you. There is no question but that the common battery is much superior, on the average.

Second, in getting central the c. b not only is the easier, quicker and more reliable, but also, on the whole, is more free from trouble, and easier to maintain. Possibly some may differ on this, but you should consider that on magneto service you must have a generator which of necessity is located at a distance from the office, and if anything goes wrong, it requires a drive to put it in commission; also, at the office, you have a sensitive drop, which the operator depends on, more or less, to signal by noise rather than by sight.

On the other hand, the c. b. is a direct, visual signal. But the greatest superiority of all, perhaps, lies in the superior supervision of the c. b.; there is nothing to equal it for absolute dependability. Words and detail might be added to these points, but if you are willing to concede that I am right on these points, then the question is settled. For, I hold, that in questions of this kind the subscriber is entitled to first consideration—second only to his willingness to pay a fair price for the service rendered. This, of course, brings us to a consideration of the question from the operating standpoint, and I must say that it does not stack up so badly from that end.

Naturally the question of maintenance comes up at once, and as I already have related, our early experience was rather discouraging for a short while. From the operating standpoint, however, I believe the advantage lies with the common battery.

With the present feature boards, one operator will take care of much more than on the ordinary boards. Installing and maintaining batteries is costly on magneto, while with the c. b. system it is done at the office. There is no driving to do. As far as trimming and maintaining the line is concerned, it *should* be equally good, whether c. b. or magneto.

One great advantage to both subscriber and the company is that the service is all of one class. The load can be distributed throughout the board, thus to some extent equalizing the peak load—especially as the rural lines are distributed over the whole board and each operator has her share.

While I am an advocate of the c. b. farm service, under proper conditions, I am not advocating indiscriminate changing. It behooves the manager to give careful consideration to the question, before deciding to go to c. b. Will the benefits accruing from the change compensate for the additional capital required and necessitated by the discarding of serviceable equipment?

I most emphatically recommend going "whole hog" if you go part way. If you expect to try it, make up your mind to keep your plant up to A No. 1 condition. If you are going to let it run down at the heel, DON'T make the change. If you are going to make the town c. b., by all means change the farm lines too; possibly not immediately, but gradually, giving preference to the short lines. Then gradually expand as your old equipment wears out.

Above all, remember that to give good transmission you must keep your circuit load resistance at not more than 750 ohms.

*Paper read before Telephone Plant Conference, Purdue University.

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**Telephone Wires and Cables**

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Copper Clad Steel Wire
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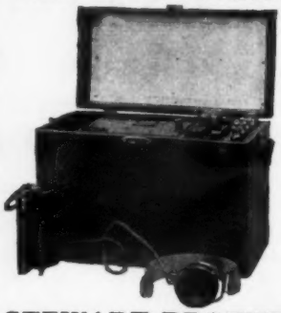
*Complete Information on Request*

**Standard Underground Cable Company**

BOSTON NEW YORK PHILADELPHIA WASHINGTON PITTSBURGH DETROIT ST. LOUIS CHICAGO SAN FRANCISCO

**The "STEWART" Cable Tester**



Get a "STEWART" Cable Tester and be ready for those lightning burns. Locates:—Lightning burns, crosses, shorts, ground and wet spots to an inch.

The "STEWART" method is the only practical method.

Sent on 10-days trial.

**STEWART BROTHERS, Ottawa, Ill.**
*MAKERS OF TESTING INSTRUMENTS*

**YAGER'S**
**Soldering Salts**

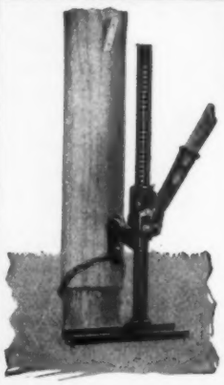
Old, tried, safe, quick Economical.

Used wherever soldering is done.

Packed in ½ lb., 1 lb. and 5 lb. enameled cans.

Sample on request.

**Alex. R. Benson Co., Inc., Hudson, N.Y.**
For list of distributors, see McRae's 1924 Blue Book



**The HANDYMAN**
**Rapid Pole Puller**

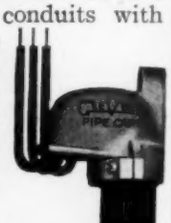
Pulls 3 ft. in one hitch. Special pole clamp makes straight upward pull. Shipped complete with clamp, chain and base.

**Price $36.00**

Ask about the HANDYMAN Guy Stretcher and Pole Pusher

**HARRAH MFG. CO.**
Bloomfield - - Indiana

Keep the weather out of the telephone service conduits with the Gee Vee Pipe Caps, made in all sizes from ½" to 6". Conduit does not have to be threaded. And ground with the Gee Vee Solderless Radio clamp for all signal and telephone grounds.



THE GILLETTE-VIBBER CO. NEW LONDON, CONN., U.S.A.

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Note Protection at Corners

**Blake Insulated Staples**

Unequalled for telephone and bell wiring. The fiber insulation prevents troublesome short circuits and grounds. 4 sizes. Pat. Nov., 1900. Write for samples.

**Blake Signal & Mfg. Co.**
BOSTON, MASS.

American Steel & Wire Co.'s W. & M.

**Telephone Telegraph Wire**

**STRAND STEEL WIRE**

**POLE STEPS**

Descriptive Literature—free

**American Steel & Wire Company**
CHICAGO NEW YORK

**LOCUST and OAK PINS and BRACKETS**

4"x30" special and standard Pins made of the very best stock obtainable. We use most modern methods and employ experts.

Remember the trademark, stamped only on pins and brackets that last and give you real service.

*Write for quotations*

**COTTAGE PLANING MILL CO.**
EVERETT, PA.